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STATISTICS.—*Some thoughts on statistical inference.*[1] W. EDWARDS DEMING, Bureau of the Census.

Definition of a statistician.—In the development of the scientific method, it is usually assumed that all observations give the same result; e.g., that $F=ma$ exactly, always. The statistical method is the scientific method, modified—that is, brought up to date—to take account of the fact that all nature is subject to variations. The chief duty of a statistician is to study these variations and to design experiments so that they may provide the maximum knowledge for purposes of prediction; another is to compile data with the same object in view; and still a third function is to help bring about changes in the sources of the data. You can go back and substitute the word scientist for statistician, and have a good definition of a scientist.

Anyone who is interested in getting the most out of an experiment, and presenting the data in such form that they can be used for meaningful predictions, is something of a statistician. A qualified statistician, however, in addition to being accomplished in some branch of science, natural or social, must also be trained in probability and the mathematics of distribution theory. He must get in and work with the scientist and be one. Some statisticians, I suppose, are better than others, but the best statisticians are the best scientists. The statistician and the scientist have the same ultimate object in view, and they must work together under the same rules. The statistician has no special license. Often his special training in distribution theory is not so much help to a statistician as his training in other topics of science.

Every interpretation of data involves a prediction.—Scientific data have no meaning until they are interpreted, and there can be no interpretation except in a predictive sense. There is no such thing as scientific data merely as facts. The interpretation can not be separated from the prediction.

[1] From a discourse delivered at the National Bureau of Standards on November 22, 1940. In substance the same material was presented at the Secchi Academy of Georgetown University on February 7, 1940. Received January 27, 1941.

The idea of presenting experimental results as original data is familiar to all of us. However, presentation as a prediction may not be so familiar; in fact some scientists and engineers may prefer to think of only two ways of presenting the results of experimental work, namely, as original data and as an interpretation. Closer examination reveals, however, that every meaningful interpretation involves a prediction. (Shewhart,[2] Ch. 3.)

Moreover,

. . . there is no knowledge of external reality without the anticipation of future experience. . . . There is no knowledge without interpretation . . . what the concept denotes has always some temporal spread. (Lewis,[3] p. 195.)

Such simple concepts as blue and round, for example, embrace not an immediate quale, but some stable pattern of relations . . . Feeling the roundness of a marble as we roll it between thumb and fingers, or measuring a house, is again a temporally extended and ordered relation of apprehended qualia . . . The ascription of a substantive or an adjective is the hypothesis of some sequence in possible experience, or a multiplicity of such experiences. (Lewis,[3] pp. 129 and 132.)

Every set of data, for generalizations and conclusions, is but a sample, and a sample of the past.—One may take data just for an inventory. There are times when it is highly important to have an inventory, as for purposes of taxation. Otherwise one takes data with the object of saying something about future data that will arise from the same cause systems, or of doing something about the source of the data so that future data will differ in a certain way from past data. You design and carry out experiments on the specific heat of steam, the fatigue of metals, the pitting of metal pipe, the disintegration of leather, not just to learn something about what the specific heat of steam was, or about those particular specimens, or the particular batches whence they were drawn, all of which were made in the past, but rather, to say what the specific heat of steam is going to be next month, or to help somebody make better or more uniform steel, leather, or pipe, in the future.

Usually you do not run experiments on all the materials and articles of a particular batch that were made in the past; you do not need to; you experiment on only part of them. You draw a sample. But even if you ran experiments on an entire batch, i.e., took a 100 percent sample of last month's production, you still would have only a sample of what would have been produced by the same machines or exactly similar machines, reoperated under the same essential conditions. You are obliged to experiment on materials or articles that were made in the past, with the object of drawing inferences about some that are to be made in the future.

[2] WALTER A. SHEWHART. *Statistical method from the viewpoint of quality control.* (The Graduate School, Department of Agriculture, Washington, 1939.)

[3] C. I. LEWIS. *Mind and the world-order.* (Scribners, New York, 1929.)

The collection of data, whether by a physicist in the laboratory, by a government census of population, agriculture, or unemployment, by a department store on its sales and complaints and quality of goods placed on the shelves, by a manufacturer who keeps records of the quality of his products, or by any other person, is for the ultimate purpose of taking some sort of action, or making recommendation for action. Even a classroom quiz is no exception; it is not given (we hope) just for the nuisance of it, but to enable the teacher to say, on the basis of past evidence, whether certain pupils will be able to go ahead in the future into more advanced work, or to hold a job. The teacher, if he is scientifically minded, will have still another object in view, namely, to improve his own teaching; by seeing how well or how poorly his pupils have picked up certain ideas that he has tried to instill into them in the past, he can judge his own work to see where he needs to adopt different methods of teaching in the future.

In taking readings with a galvanometer you can always conceivably take one more reading, but in actual practice you are satisfied with a finite number. From these readings taken in the past, you make statements about what someone else will find when he takes readings in the future. Whatever special studies are pursued by statisticians, the chief object of learning them is to acquire facility in making predictions from data, and in presenting data in such form that others can do the same.

What I am saying was voiced more succinctly by Fry of the Bell Telephone Laboratories, at the University of Pennsylvania Bicentennial Celebration:

> The statistical method is used for saying something about data that we are about to take, not what we have already taken.[4]

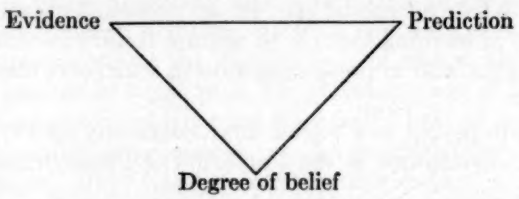
A word on sampling and the census.—So far as scientific generalizations and predictions are concerned, the distinction between a sample and a complete count (a perfect census, tests run on all of last month's production, all the readings that you might have taken with your galvanometer but did not), is only one of degree. A complete count of last month's production is only a bigger sample than part of it. Both are samples of what might have resulted, and the kind of results that are to be expected in the future from the same underlying cause system. In population studies, the births, deaths, vocations, migrations, and educational attainments of a population are changed and directed by a myriad of chance causes, superimposed on certain underlying

[4] THORNTON C. FRY. September 19, 1940. The quotation given may not be verbatim.

social and economic cause systems. A census, even if perfect, is subject to the variations of chance because it describes only one of the many possible populations that might have been found as the result of this combination of chance causes and main causes. Any generalizations (i.e., predictions) must recognize the fact that some other population might have resulted, and in fact must be expected to arise in the future, from the same underlying causes.[5]

How big a sample? The three components of knowledge.—Seeing, then, that we must make our predictions about the future from samples of the past, the question arises: How big must these samples be? How much data do we need? One distinguishing characteristic of a good scientist, I should say, is that he knows good data and knows when he has enough of it.

But how much is enough? 10, 20, 50, 100, or 1,000 readings? The answer is not a simple yes or no. It is tied up with the idea that a prediction, if it is to convey knowledge, must be based on evidence. The degree of belief in any prediction is closely linked with the prediction and the evidence. Shewhart (*op. cit.*, p. 86) exhibits the triangular relation shown below, linking the three components of knowledge:



THE THREE COMPONENTS OF KNOWLEDGE

On the basis of certain evidence, you would make certain predictions, and in so doing, convey a certain degree of belief. A prediction is expressed in terms of data that one would expect to get if he were to perform certain experiments in the future. A prediction without any supporting evidence conveys no degree of belief. Thus, if I say it is going to rain day after tomorrow, I have made a prediction, but created no degree of belief, because you have no evidence, since I have no standing as a weather prophet. You would likely not carry your umbrella or cancel your trip on the basis of my prediction. The results of experimental work are usually summarized in terms of predictions and evidence. Shewhart gives a rule for the presentation of data, stat-

[5] This topic is pursued in more detail in a paper by W. EDWARDS DEMING and FREDERICK F. STEPHAN in the Journal of the American Statistical Association, March 1941.

ing that original data, if summarized, should be summarized in such a way that the evidence in the original data is preserved for all the predictions that are thought to be useful. Judgment is of course required in regard to just which predictions are to be assumed useful, but this is where scientific judgment must be exercised.

The question before us is how much data does one need? We are now ready to get back to it and look for an answer. I should say that one needs enough data—i.e., evidence—to provide some substantial degree of belief in whatever predictions he chooses to make or expects others to make. A physicist usually does not commence to record data for publication or calibration until his apparatus has been perfected to a state satisfactory to him; and he stops when further data, in his judgment, would create no greater degree of belief in any prediction that he may wish to make from that experiment.

Statistical control.—In the state of statistical control or the state of randomness, the data from an experiment, or the measurements on a product manufactured, display the characteristics of statistical stability. They behave as if they were samples being drawn at random from a stable universe. The ideal stable universe is a bowl of physically similar numbered chips. When they are thoroughly stirred and drawn blindfolded with replacement, the resulting sequence of numbers is the result of a random operation. (The necessity for extreme care in attempting to carry out any random operation, even in so simple an experiment as drawing numbers from a bowl, can hardly be overemphasized.) In experimental work, and in manufacturing, one can not form a judgment in regard to the attainment of statistical control until his experiment or process has been continued long enough to be subjected to Shewhart's Criterion I, which requires at least 100 readings.[6]

In the state of statistical control, the distribution theories of mathematical statistics apply, and it is possible to make a valid prediction concerning the next hundred or thousand observations; it is possible, for instance, to draw a pair of limits (control limits) such that whenever a future observation falls outside these limits, it will be worth while to look for an assignable cause of variation in the process.

The state of statistical control is the goal of all economic manufacture of materials. It is not usually the goal in experimental work in pure science; but this is only an illustration of the fact that some

[6] This criterion for randomness is discussed by SHEWHART in his *Economic control of quality* (Van Nostrand, 1931), pp. 304–318. For a description of a "normal" bowl, and the results of 4,000 drawings therefrom, see SHEWHART'S *Economic control of manufactured product* (Van Nostrand, 1931), table 22 and Appendix II.

requirements of industry are more exacting than the requirements of pure science. Usually an experimental physicist or chemist is satisfied to eliminate trends and erratic disturbances in his experiment to a point wherein he feels confident that he can draw a pair of limits that include any future observations that he might make by that method. He may continue making adjustments until he can set these limits narrower than has been possible in any previous similar experiment. If, with still further adjustments, his experiment were brought to a state of statistical control, still narrower limits could be set with even greater confidence. However, we shall find that the course adopted by the pure scientist is very often justifiable from the standpoint of accuracy, for the reason that any limits that he might draw on the basis of one experiment refer only to what may be expected from that particular method, but they do not by themselves give any indication of systematic errors nor of what may be expected from some other method of measurement.

Accuracy and precision.—Scientists have for long toyed with the hope of finding some logical method of inferring from a given set of data what the accuracy of those data may be. The idea is an exciting one, but it is a vain hope; the data of a single experiment, or even of a number of experiments, do not by themselves provide all the evidence that is needed for stating the true value of the thing being measured. For to say something about the true value, one must predict what will be the result of all other methods of measurement, not only those methods that have been tried out, but also all those that are yet to be devised. He must also be able to explain any discrepancies between different methods. More methods and more data (good data) add new evidence to our knowledge, but of knowledge there is no end. The concept of true value arises not from any highly consistent results arising from one experiment, but from consistent results from many different kinds of experiments. Think of the different ways of measuring e/m. When two or three of them had been discovered, and found to give consistent results, there was reason to begin thinking that something was known about e/m. But new data and new methods can always upset predictions, and such has been the history of physics. "Knowing begins and ends in experience; but it does not end in the experience in which it began."[7]

The objectivity of being able to make a valid prediction of the limits within which the future data of a single method of measurement will fall is in contrast with the subjectivity of assigning limits within

[7] C. I. Lewis. *Experience and meaning*, Philos. Rev. 13: 134. 1934.

which the data of that and all other methods will fall. This contrast is expressed by the distinction between the words precision and accuracy. The limits set by a single experiment give a measure of the precision of that experiment, or of that method of measurement, but they give no objective criterion of the accuracy of the result, because they refer to the one experiment only, and not to all the other methods that are or have been devised.

In order to convey knowledge, the Δx in $x \pm \Delta x$ must have an operationally verifiable meaning in the form of a prediction. This will be one sort of a prediction in a statement regarding precision, but a very different one in a statement regarding accuracy.

To see how these remarks apply in practice, let us think of a certificate issued by the National Bureau of Standards on a precision standard.

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON
NATIONAL BUREAU OF STANDARDS

Certificate
for
Standard Resistor

Manufactured by _____, Serial No. _____

Submitted by

The _____ _____ Company

of _____

The above-described resistor was found in September 1940, at a temperature of 25°C, to have a resistance of

9.9999 International Ohms.

The value given is correct within 0.005 percent. This statement of accuracy takes into consideration the uncertainty in the realization of the International Ohm from its definition and allows for normal changes of resistance with time.

LYMAN J. BRIGGS, *Director*

Let us try to see the element of prediction in this certificate. Perhaps we shall agree that a certificate is a prediction. When a piece of apparatus is of such poor quality that you dare not risk a prediction on it, you do not issue a certificate, but may instead issue a report. In issuing a certificate you risk making a prediction regarding the future behavior of a piece of apparatus that was sent in for test; in a report you merely record a bit of history—how it behaved, in terms of your own standards—while it was here. You leave the risk of prediction to the owner of the apparatus.

In the testing of precision standard resistors at the National Bureau

of Standards, the measurements can ordinarily be duplicated within a range of 1 part in 100,000 to 1 part in 10,000,000, depending partially on the magnitude of the resistor, but more particularly on its quality. In the example given above, the measurements can be duplicated from day to day with variations of not more than one unit in the fifth decimal place, and the resistance is therefore determined in terms of the N.B.S. Ohm to within this magnitude. These are statements of precision and are objective. As for accuracy—comparison with the International Ohm, and behavior after being shipped back to its owner—you are obliged to depend on intuition. You allow a wide factor of safety; your certificate risks a prediction that is 50 times as wide as the latitude of reproducibility of your measurements. You did not make a direct comparison with the International Ohm, and you did not run a test on the change of resistance of this particular resistor with time, and certainly not after it was sent back to its owner. But you have had many years' experience with similar resistors, and you are led by intuition to make statements (predictions) regarding the accuracy of this particular one. You feel safe in predicting its behavior. For resistors of better quality, you would name narrower limits, and for one of particularly good quality, you might even make a prediction regarding the variation of its resistance with temperature.

In a certificate you are not talking about your own apparatus: you are talking about the apparatus that was sent in for test.

Intuition may at times be very helpful, but intuition, like the conscience, must be trained. The distribution theory of statistics should be a part of this training. The rest of us may well be satisfied to pin our faith on the intuition of an expert. And perhaps our own intuition helps us to distinguish between experts and others whose intuition is not so reliable.

Pure distribution theory, by itself, is nigh helpless until the state of statistical control is attained and proved. Since statistical control seldom exists in experimental work, the interpretation of scientific data remains, for the most part, a matter of cooperation between the statistician and the scientist, each assisting the other in the process of adjusting the apparatus, and finally in making predictions from the results. The peculiar training of the statistician enables him to help the physicist or engineer to weed out assignable causes of variation and to attain uniformity; in fact, as I said, one of the chief duties of a statistician is to help bring about desirable changes in the source of the data that he takes. His services are especially useful in industry,

where the economic advantages of statistical control are coming to be more and more recognized. Huge financial savings are being effected, not only in industry, but also in a number of government departments by the application of statistical methods.

My main theme is that the interpretation of scientific data involves prediction. Facts, so far as science is concerned, have meaning only in the predictions that can be made from them. A prediction must be made in terms of some operation that will prove the prediction either true or false. The methods of the statistician take into account the variabilities in nature, and his special training enables him to make the most efficient use of data for valid predictions when it is possible to make predictions. He also knows when predictions can not be made. The statistical method is an aid to the scientist in understanding the nature of the knowledge that he is continually seeking.

In conclusion, it is a pleasure to express my indebtedness to conversations with Dr. Frank Wenner of the National Bureau of Standards, particularly in regard to the interpretation of certificates.

BOTANY.—*Names in* Amaranthus, Artocarpus, *and* Inocarpus.[1]

F. R. FOSBERG, U. S. Bureau of Plant Industry. (Communicated by W. T. SWINGLE.)

To make available the correct names for certain species and to save other workers the trouble of searching the literature for a solution to the *Amaranthus tricolor* problem, it seems worth while to publish the notes given below.

Amaranthus tricolor L. [Amaranthaceae]

In *Species plantarum*, ed. 1, p. 989, 1753, Linnaeus described *Amaranthus tricolor*, *A. melancholicus*, and *A. tristis*, distinguished by trifling differences in leaf color and outline. In edition 10 of the *Systema*, p. 1268. 1759, he added *A. gangeticus*, also very closely allied to the above three. Various other species were added to the complex later, but as they have no bearing on the nomenclatorial problem, they will not be discussed here. The object of this note is to establish which of the above names is correct if all four names are considered synonymous, the opinion held by most modern botanists.

Botanists generally, with the exception of Lamarck and Moquin, up to the time of Hooker's *Flora of British India* (1885), followed Linnaeus without question in recognizing at least four species. Lamarck, in the first volume of the *Encyclopédie méthodique* (p. 115. 1783) made *A. melancholicus* L. a variety of *A. tricolor* L., but recognized *A. gangeticus*, *A. mangostanus*, and *A. tristis* as distinct species. Poiret, in the *Supplement* (vol. 1, pp. 311–312.

[1] Received November 27, 1940.

1810) and in the text to the *Tableaux* (p. 355, text for pl. 767. 1823) restored *A. melancholicus* to specific rank.

Moquin, in DeCandolle's *Prodromus* **13** (2): 262. 1849, evidently misinterpreting Poiret's synonymy, made *A. tricolor* a variety of *A. melancholicus*, citing the *Tableaux* as authority.

Boissier, in the *Flora Orientalis* **4**: 990. 1879, mentioned only *A. gangeticus*, giving neither synonyms nor related species.

J. D. Hooker, in the *Flora of British India* **4**: 719–720. 1885, reduced *A. tricolor*, *A. melancholicus*, and *A. tristis* (the latter with some doubt) to the later *A. gangeticus*. The reason for this abrogation of the rule of priority is not clear to me. Perhaps it was simply an oversight due to the unfortunate custom, then in vogue, of omitting the dates from all reference citations. At any rate, *A. gangeticus* can not be the correct name for the aggregate. British botanists, during the next quarter century, except Hiern in the *Catalogue of Welwitch's African plants* **2**: 887. 1900, and Baker and Clarke in the *Flora of Tropical Africa* **6** (1): 32. 1909, followed Hooker's disposition of the matter. Some other botanists (cf. Kung Hsien-wu in Liou Tchen-ngo, *Fl. Ill. du nord de la Chine* **4**: 15. 1935) even much more recently, are still following him, in obvious disregard of the rules of nomenclature.

Fiori and Paoletti, in *Flora analitica d'Italia* **1**: 321. 1898, were the first modern botanists to reduce *A. gangeticus*, *A. mangostanus*, and *A. melancholicus* to *A. tricolor*. *A gangeticus* was maintained in a subordinate category. No mention was made of *A. tristis*.

In this century Hiern (see above), Baker and Clarke (see above), Thellung (in Ascherson and Graebner, *Syn. Fl. Mittel-Eur.* **5**: 272–280. 1914), Merrill (*Enum. Phil. Fl. Pl.* **2**: 128. 1923 and other papers), and Bailey (*Man. Cult. Pl.* 252. 1924) have followed this course, which seems to be the correct one.

Article 56 of the International Rules (Cambridge) reads, in part: "When two or more groups of the same rank are united . . . if the names or epithets are of the same date . . . the author who first adopts one of them, definitely treating another as a synonym or referring it to a subordinate group, must be followed." Strict application of this rule makes it quite clear that the reduction by Lamarck (*Encycl.* **1**: 115. 1783) of *A. melancholicus* to a variety of A. *tricolor* determines that the latter is the correct name for the aggregate (unless someone should show that two or more of the species had been combined previous to Lamarck's publication).

The essential synonymy to establish this point is given below. The extensive post-Linnaean synonymy is largely unnecessary here and may be found in the intricate treatment of *A. tricolor* L. by Thellung in Ascherson and Graebner, *Syn. Fl. Mittel-Eur.* **5**: 272–280. 1914.

Amaranthus tricolor L. Sp. Pl. 989. 1753.

Amaranthus melancholicus L. Sp. Pl. 989. 1753.
Amaranthus tristis L. Sp. Pl. 989. 1753.
Amaranthus gangeticus L. Syst. X: 1268. 1759.
Amaranthus mangostanus L. Cent. I: 32. 1755.

Amaranthus tricolor L. var. *melancholicus* Lam. Encycl. **1**: 115. 1783.
Amaranthus melancholicus L. var. *tricolor* Lam. ex. Moq. in DC. Prodr. **13** (2): 262. 1849.

Artocarpus altilis (Parkinson) Fosberg [Moraceae]

In a longer paper, not as yet published, I have discussed the validity of the names published in Parkinson's *Journal of a voyage to the South Seas in H.M.S. Endeavour*, etc., published in 1773. As it may be some time before this paper is published, it seems desirable to make the necessary combinations for this and the following well-known species, so that they may be used.

The well-described genus *Sitodium* Parkinson antedates by three years *Artocarpus* Forst. I have elsewhere (Amer. Jour. Bot. **26**: 231. 1939) proposed *Artocarpus* for conservation, as it contains well-known economic plants (breadfruit, jakfruit), but, owing to the European war, there seems little chance of holding a congress in the near future to vote on such propositions. In the meantime it seems desirable to go on using the name *Artocarpus*, rather than making a temporary shift to the unfamiliar *Sitodium*. Since the principle of conserved specific names was decisively rejected by the congress in 1935, it is necessary to transfer Parkinson's specific epithet to *Artocarpus*.

E. J. H. Corner, in a well-thought-out article in Gard. Bull. S. S. **10**: 280–282. 1939, discussed the reasons why *Artocarpus incisus* (Thunb.) L. f. should be used for the common breadfruit rather than *A. communis* Forst., both specific epithets published the same year (1776), with no indication available as to which was earlier. The problem would have been solved without the discussion had Corner been aware of the availability of Parkinson's epithet, published three years earlier. The combination and synonymy follow:

Artocarpus altilis (Parkinson) Fosberg, n. comb.

Sitodium altile Parkinson, Journ. Voy. *Endeavour* 45. 1773.
Artocarpus communis Forst. Char. Gen. 101. 1776.
Radermachia incisa Thunb. Handl. Vet.-Akad. Stockh. **37**: 254. 1776.
Artocarpus incisus (Thunb.) L. f. Suppl. 411. 1781.

Corner's spelling of Thunberg's generic name *Rademachia* instead of *Radermachia* is an error that, according to the *Index Kewensis*, originated with Steudel.

Inocarpus fagiferus (Parkinson) Fosberg [Leguminosae]

Aniotum Parkinson, as in the case of *Sitodium* mentioned above, antedates a well-known generic name, *Inocarpus*, the Tahitian chestnut, *mape* (Tahiti), *kopit* or *kerepit* (Malay, cf. Corner, Gard. Bull. S. S. **10**: 269. 1939). As with *Artocarpus*, I have proposed *Inocarpus* for conservation, and for the same reasons as given above, I am here making the combination for Parkinson's specific name under *Inocarpus*.

Inocarpus fagiferus (Parkinson) Fosberg, n. comb.

Aniotum fagiferum Parkinson, Journ. Voy. *Endeavour* 39. 1773.
Inocarpus edulis Forst. Char. Gen. 66. 1776.

Corner (Gard. Bull. S. S. **10**: 269–270. 1939) in his discussion of whether this species is native in Malaya cast some doubt on the statement of Brown (Bishop Mus. Bull. **130**: 118. 1935) that in the Marquesas this species reaches a height of 10 meters. He describes it as "a smallish and slow-growing tree." I know nothing about the rate of growth and have not actually measured any trees. No one, however, who has seen the trees of this species in some of the deep valleys of Tahiti (Aparé Maué, Papenoo, etc.) could possibly describe the tree as smallish. It has huge buttressed trunks, many feet in diameter, that compare favorably with the giant ceiba trees shown in tropical pictures, and the trees are certainly well in excess of 10 meters tall.

BOTANY.—*New Acanthaceae from Guatemala.*[1] E. C. LEONARD, U. S. National Museum. (Communicated by WILLIAM R. MAXON.)

During the 1938–39 Sewell Avery Expedition of the Field Museum of Natural History to Guatemala, Paul C. Standley collected a considerable number of Acanthaceae. In the present paper, based on a study of these specimens, six new species are described, one is transferred from *Eranthemum* to *Pseuderanthemum*, and one is renamed.

Ruellia brittoniana Leonard, nom. nov. Fig. 1

Cryphiacanthus angustifolius Nees in DC. Prodr. **11**: 199. 1847. Not *R. angustifolia* Sw., 1788.

Ruellia spectabilis Britton, Ann. New York Acad. **7**: 192. 1893; not Nichols, 1886.

Fig. 1.—*Ruellia brittoniana* Leonard: *a*, Portion of plant, half natural size; *b*, capsule, natural size.

Cultivated near Quiriguá, Department Izabal, Guatemala, altitude 70 to 150 meters, April 26–27, 1939, *Standley* 72225.

[1] Received November 8, 1940.

Ruellia donnell-smithii Leonard, sp. nov. Fig. 2

Herbae, caulibus quadrangularibus superne cano-pilosulis, infra glabratis; lamina foliorum ovata vel oblongo-ovata, obtusa, basi angustata in petiolum decurrens, integra vel leviter undulata, cano-pilosula, subtus glandulis rotundatis vestita; flores subsessiles axillares solitarii subterminales; calycis segmenta glanduloso-pilosula, lineari-lanceolata; corolla purpurella, parce

Fig. 2.—*Ruellia donnell-smithii* Leonard: *a*, Portion of plant; *b*, calyx; *c*, capsule. (*a*, half natural size; *b*, *c*, natural size.)

puberula; capsula puberula glandulis rotundatis vestita; semina nigra, plana, suborbicularia, madefacta dense mucoso-pubescentia.

Erect or decumbent herbs up to 30 cm high or more; stems simple or branched, quadrangular, the tips densely gray-pilosulous, the lower portions often glabrate; leaf blades ovate to oblong-ovate, 2 to 5 cm long, 1 to 2.2 cm wide, obtuse, narrowed at base and decurrent on the petiole, entire or shallowly undulate, grayish-pilosulous, or the older leaves subglabrous, the under surface with scattered roundish glands; petioles 2 to 4 mm long; flowers axillary, solitary, subsessile, borne at or near the tip of the stems; calyx glandular-pilosulous with spreading hairs without, strigose within, the tube 2 mm long, the segments linear-lanceolate, 10 to 12 mm long, 1.25 mm wide at base, gradually narrowed from above the base to a slender blunt tip; corolla 3 to 4 cm long, light purple, sparingly puberulent, the lower half of the tube slender, about 1.5 mm in diameter, the upper portion obconic, about 1 cm broad at the mouth, the limb spreading, 2.5 to 3 cm broad, the lobes suborbicular, 10 to 12 mm wide, rounded; filaments glabrous, one of each pair 2 mm long, the other 7 mm long; ovary puberulent; style 2 cm long, puberulent; capsule 10 to 12 mm long, 4 mm broad toward tip, narrowed to a solid stipitate base 3 mm long and 2 mm broad, puberulent, with small round glands; seeds flat, black, suborbicular, 4 mm in diameter, mucilaginous-pubescent when moistened.

Type in the U. S. National Herbarium, no. 944013, collected at San Luís, Department Escuintla, Guatemala, March, 1890, by John Donnell Smith (no. 2015).

Additional specimens examined:

MEXICO: Mount Ovando, Chiapas, March 30, 1935, *Matuda* 123.

GUATEMALA: Below Las Lajas, Department Escuintla, altitude 900 to 1,200 meters, in a dry thicket, February 9, 1939, *Standley* 64807.

Close to *R. geminiflora* H.B.K. but readily distinguished by its densely glandular-pilosulous calyx.

Ruellia standleyi Leonard, sp. nov. Fig. 3

Herbae viscidae, caulibus subquadrangularibus, glanduloso-pilosis; lamina foliorum ovata vel elliptica, pilosula, apice breviter acuminata, basi rotundata

Fig. 3—*Ruellia standleyi* Leonard: *a*, Tip of panicle; *b*, leaf; *c*, calyx; *d*, ovary and style; *e*, portion of panicle from fruiting plant. (*a*, natural size; *b*, half natural size; *c*, *d*, *e*, natural size.)

vel truncata; petioli glanduloso-pilosi; panicula terminalis, glanduloso-pilosa; calycis segmenta lineari-subulata, glanduloso-pilosa; corolla anguste campanulata, lobis parvis; capsula oblonga, glabra vel apice parce pubescens; semina plana, brunnea, madefacta mucoso-pilosa.

A viscid herb up to 1.3 meters high; stems subquadrangular, glandular-pilose or the lower portions glabrate; leaf blades ovate to elliptic, up to 15 cm long and 10 cm wide, short-acuminate, narrowed, rounded or truncate at the base, pilosulous, the pubescence denser beneath than above, the costa

and lateral veins (5 to 8 pairs) rather prominent; petioles up to 9 cm long, glandular-pilose; inflorescence a terminal, much branched, glandular-pilose panicle, the flowers rather numerous, subsessile, axillary or borne in the forks of the branches of the panicle; bracts lanceolate to subulate, small, or the lowermost larger and leaflike; calyx 15 mm long at maturity, the segments linear-subulate, rounded at tip, glandular-pilose, the hairs spreading, rather scattered, up to 1.5 mm long; corolla up to 18 mm long, finely pubescent, narrowly campanulate, the lobes about 3 mm long; stamens glabrous, the filaments of the longer pair about 4 mm long, those of the shorter pair about 2 mm long, the anthers about 2.5 mm long; style about as long as the corolla; capsules oblong, 15 mm long, 3.5 mm broad, glabrous or bearing a few minute hairs toward the tip, 8- to 10-seeded; seeds brown, flat, 2.5 mm long, a little more than 2 mm broad, finely gelatinous-pilose when moistened.

Type in the herbarium of the Field Museum of Natural History, no. 992848, collected on Finca Pireneos, below Santa María de Jesús, Department Quezaltenango, Guatemala, altitude 1,350 to 1,380 meters, in a damp forest, March 11, 1939, by Paul C. Standley (no. 68390).

Additional specimens examined:

DEPT. QUEZALTENANGO: Damp forest near El Muro, below Santa María de Jesús, altitude about 1,200 meters, *Standley* 67150.

DEPT. SUCHITEPÉQUEZ: Wet thicket near Pueblo Nuevo, altitude about 750 meters, *Standley* 66970.

DEPT. SAN MARCOS: Wet thicket along Río Ixpal, below Rodeo, altitude about 750 meters, *Standley* 68720.

This is closely related to *Ruellia paniculata* L., but it can be distinguished easily by its large, nearly naked terminal inflorescence and larger capsules, in *Ruellia paniculata* the inflorescence being axillary and leafy and the capsules narrowly cylindric and not over 9 mm long. It resembles more closely *R. ochroleuca* Mart., but in that species the inflorescence is not glandular. From herbarium material it is impossible to determine the color of the corolla.

Pseuderanthemum praecox (Benth.) Leonard, comb. nov.

Eranthemum praecox Benth. Pl. Hartw. 291. 1848.
Siphoneranthemum praecox Kuntze, Rev. Gen. Pl. 497. 1891.

Dry oak and pine forest near San Martín Jilotepeque, Department Chimaltenango, Guatemala, altitude about 1,800 meters, February 3, 1939, *Standley* 64391. Dry rocky hills north of Santa Rosa, Department Baja Verapaz, Guatemala, March 30, 1939, *Standley* 69829.

Dicliptera debilis Leonard, sp. nov. Fig. 4

Herba debilis, caulibus parce pilosis; lamina foliorum ovata vel lanceolata, acuminata, basi angustata, in petiolum decurrens; cymae axillares, subsessiles, bracteis triangulari-ovatis, cuspidatis, coriaceis, carinatis, ciliatis, carina strigosa; bracteae floriferae oblanceolatae, obtusae vel rotundatae, apiculatae; bracteolae lanceolatae, puberulae; calycis segmenta subulata; corolla subrufa, minute pubescens; capsulae parce glanduloso-puberulae.

Weak herb; stems up to 3.3 meters long, sparingly pilose, the hairs retrorsely curved; leaf blades ovate to lanceolate, acuminate (the tip blunt), narrowed at base and decurrent on the petiole, sparingly pilose except the

costa, this densely hirtellous; petioles slender, up to 1.5 cm long, hirtellous, the hairs curved; flowers borne in subsessile, axillary, 3-parted cymes; bracts subtending the cyme triangular-ovate, 3 to 3.5 mm long, 1.5 to 2 mm wide, cuspidate, coriaceous, carinate, ciliate, the keel strigose; bracts subtending the flowers oblanceolate, obtuse or rounded, apiculate, pilosulous without, puberulent within (some of the hairs glandular), the larger of the middle pair about 1.5 cm long and 7 mm wide, the larger of the lateral pairs 12 mm long and 6 mm wide, the smaller bracts of each pair 8 mm long and 3.5 mm wide;

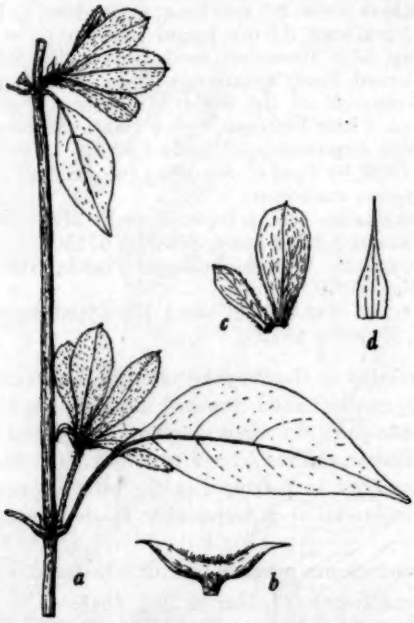


Fig. 4.—*Dicliptera debilis* Leonard: *a*, Portion of plant; *b*, bracts subtending the cyme; *c*, bracts subtending the flowers (inner surfaces); *d*, calyx segment. (*a*, natural size; *b*, twice natural size; *c*, natural size; *d*, twice natural size.)

bractlets lanceolate, the larger pair 6 mm long, slightly over 1 mm wide, the smaller pair 5 mm long and slightly less than 1 mm wide, all puberulent; calyx 8 mm long, puberulent, the segments subulate, 6 mm long, 1 mm wide at the base; corolla 2.5 to 3 cm long, pale red, minutely pubescent, the tube slender; capsules (immature) 1 cm long, sparingly glandular-puberulent.

Type in the herbarium of the Field Museum of Natural History, no. 992431, collected north of Santa Rosa, Department Baja Verapaz, Guatemala, in pine-oak forest on a dry rocky hill, March 30, 1939, by Paul C. Standley (no. 69823).

Apparently unrelated to any other Central American member of the genus. The lower leaves, early deciduous and absent in the type specimen, are probably larger than the uppermost, from which the measurements are taken.

Dicliptera inutilis Leonard, sp. nov. Fig. 5

Suffrutex, caulibus parce et minute pubescentibus, deorsum glabris; lamina foliorum ovata, acuminata, basi angustata, hirtella; cymae axillares et terminales breviter pedunculatae, 3-partitae; bracteae floriferae oblongo-ovatae, subobtusae, basi truncatae, virides, venosae, parce pubescentes;

Fig. 5.—*Dicliptera inutilis* Leonard: *a*, Portion of plant, natural size; *b*, bractlet, twice natural size.

bracteolae lanceolatae; calycis segmenta lanceolata, minute pubescentia; corolla purpurea, parce pubescens.

Shrubby herb up to 1.3 meters high; stems much branched, sparingly and minutely pubescent, or the lower parts glabrate; leaf blades (uppermost) ovate, up to 4 cm long and 3 cm wide, acuminate (the tip blunt), narrowed at base, hirtellous, the hairs confined chiefly to the costa and veins; petioles up to 1 cm long, hirtellous; flowers borne in axillary and terminal short-peduncled 3-parted cymes, the peduncle 1 to 3 cm long, subtomentose; bracts subtending the middle cluster of flowers oblong-ovate, up to 2 cm

long and 1.2 cm wide, subobtuse, truncate at base, green, veiny, sparingly puberulent, the bracts of the lateral clusters similar but smaller; bractlets lanceolate, up to 6 mm long and 1.5 mm wide, minutely pubescent beneath, glabrous above; calyx segments lanceolate, about 5 mm long and slightly more than 1 mm wide, minutely pubescent; corolla 2 to 2.5 mm long, rose-purple, sparingly pubescent; capsule not seen.

Type in the herbarium of the Field Museum of Natural History, no. 993732, collected at Los Llanitos, near San José Acatempa, Department Jutiapa, Guatemala, altitude about 1,200 meters, in a moist thicket, December 21, 1938, by Paul C. Standley (no. 60579).

Distinct from other Central American species of *Dicliptera* in its subsessile 3-parted cymes and its rather large, oblong-ovate, green, veiny bracts. The lower leaves, early deciduous and therefore lacking in the type material, probably exceed the dimensions here given for the uppermost leaves.

Dicliptera membranacea Leonard, sp. nov. Fig. 6

Herba, caulibus ramosis, glabris vel ad nodos parce et minute pubescentibus; lamina foliorum ovata vel oblongo-ovata, subobtusa, acuta vel breviter acuminata, basi angustata, in petiolum decurrens, glabra vel subtus parce pubescens; petioli graciles; cymae sessiles vel subsessiles, flabelliformes, axillares vel terminales, bracteis ovatis, viridibus, venosis, subtus minute pubescentibus, basi cuneatis, marginibus angustis albis; bracteae floriferae inaequales oblanceolatae, parce pilosulae, ciliatae, apice rotundatae apiculataeque vel acutae, virides, margine basi alba; bracteolae lineares, albidae, acuminatae, ciliatae; calycis segmenta subulata, puberula, subhyalina; corolla pubescens, purpurella, tubo gracili; ovarium pubescens.

Branching herbs up to 1.3 meters high; stems glabrous or sparingly and minutely pubescent at nodes; leaf blades ovate to oblong-ovate, up to 10 cm long and 6 cm wide, subobtuse to acute or abruptly acuminate (the tip blunt), narrowed at base and decurrent on the petiole, thin, drying bright green, glabrous or with a few minute hairs beneath; petioles slender, up to 4 cm long, glabrous or sparingly pubescent; flowers borne in sessile or subsessile axillary and terminal fanlike cymes, usually of 4 flowers each; bracts subtending the cymes ovate, up to 12 mm long and 6 mm wide, green, veiny, leaflike, sparingly and minutely pubescent beneath, glabrous above, the cuneate basal portion with a narrow white margin; bracts subtending the flowers unequal, oblanceolate, green with a narrow white border at the base, sparingly pilosulous, ciliate, the larger pair subtending the middle flower cluster 12 mm long and 6 mm wide, rounded at apex and minutely apiculate, the smaller bracts 10 mm long and 3 mm wide, rounded and apiculate, the bracts subtending the lateral flower clusters successively smaller and more acute; bractlets subtending the flowers linear, the larger pair 11 mm long and 1.5 mm wide, the smaller pair 9 mm long and 1 mm wide, all acuminate, whitish, 1-nerved, ciliate, the costa hirtellous; calyx segments subulate, 6 mm long, 0.5 mm wide, subhyaline, ciliate, 3-nerved, puberulent; corolla 13 mm long, pubescent, pale purple, the tube slender; ovary pubescent; capsule not seen.

Type in the U. S. National Herbarium, no. 1780239, collected between Río Jute and Río Pantaleón, on the road between Escuintla and Santa Lucía Cotz, Department Escuintla, Guatemala, in a thicket, altitude 540 to 720 meters, January 24, 1939, by Paul C. Standley (no. 63524); duplicate in the

herbarium of the Field Museum of Natural History. No. 63515 of Mr. Standley's collection, from the same locality, is this species also.

Dicliptera membranacea apparently has no close relatives in Central America. The specific name alludes to its thin, green leaf blades.

Fig. 6.—*Dicliptera membranacea* Leonard: *a*, Portion of plant, natural size; *b*, one of the bracts subtending the cyme; *c*, bracts subtending the middle flower cluster of a cyme; *d*, bractlets; *e*, calyx segment. (*b*, *c*, *d*, *e*, twice natural size.)

Streblacanthus parviflorus Leonard, sp. nov. Fig. 7

Suffrutex, caulibus teretibus, bifariam pubescentibus; lamina foliorum elliptica vel late lanceolata, acuminata, basi rotundata, membranacea, integra, glabra, costa et venis minute pubescentibus exceptis; petioli graciles; spicae terminales et axillares; bracteae bracteolaeque filiformi-subulatae, minute pubescentes; calycis segmenta filiformi-subulata, minute pubescentia; corolla alba, minute pubescens, labio superiore oblongo-ovato, emarginato, inferiore trilobo, lobis ovatis, subobtusis; capsulae complanatae, stipitatae, minute et parce pubescentes; semina pallide brunnea, papillosa.

Suffrutescent herb up to 60 cm high; stems terete, pubescent in two lines;

leaf blades elliptic to broadly lanceolate, up to 6 cm long and 3.5 cm wide, acuminate (the tip blunt), rounded at base, thin, entire, glabrous except upon the costa and lateral veins, these minutely and inconspicuously pubescent with curved hairs; petioles slender, up to 4 cm long, glabrous or the grooves pubescent; flowers borne in terminal and axillary spikes up to 5 cm long; bracts, bractlets, and calyx segments filiform-subulate, about 1.5 cm

Fig. 7.—*Streblacanthus parviflorus* Leonard: *a*, Portion of plant, natural size; *b*, bract; *c*, calyx segment; *d*, pistil. (*b*, *c*, *d*, twice natural size.)

long, the bracts 1.5 mm wide at the base, the bractlets 0.5 mm wide, the calyx segments 1 mm wide, all 3-nerved, sparingly and minutely pubescent; corolla white, 17 mm long, minutely pubescent, the tube slender from base to middle, about 1 mm in diameter, the upper half obconic, 3.5 mm in diameter at mouth, the limb slightly 2-lipped, the upper lip oblong-ovate, 3 mm wide at base, emarginate, the lower lip 3-lobed, the lobes ovate, 4 mm long and 2.5 mm wide, subobtuse; anthers 2 mm long, 1 mm wide; style 6 mm long, glabrous; capsule 12 mm long, flattened, stipitate, 4 mm wide, 4-seeded, minutely and inconspicuously pubescent, the hairs spreading; seeds flat, light brown, 4 mm in diameter, minutely alveolate, roughened by short papillae.

Type in the herbarium of the Field Museum of Natural History, no. 990984, collected at Escoba, across the bay (west) from Puerto Barrios, Department Izabal, Guatemala, in a wet forest near sea level, May 3, 1939, by Paul C. Standley (no. 72949). Duplicate in U. S. National Herbarium, no. 1780245.

Streblacanthus parviflorus is related to *S. cordatus*, a species apparently limited to Panamá. The calyx, bracts, and bractlets are similar in both species, but in *S. cordatus* the flowers are much longer and larger and the leaves are strongly cordate.

ORNITHOLOGY.—*Remarks on the Kentish plovers of the Extreme Orient, with separation of a new subspecies.*[1] H. G. DEIGNAN, U. S. National Museum. (Communicated by HERBERT FRIEDMANN.)

In ascertaining which forms of the Kentish plover (*Charadrius alexandrinus*) occur in winter in the Indo-Chinese countries, I have found it necessary to review the extensive material of this species from eastern Asia in the U. S. National Museum and have arrived at conclusions rather at variance from those of the most recent revisers.

Their treatment has recognized two races in the Far East: (1) *dealbatus* of Swinhoe, a long-billed bird, described from South China (type specimen from Amoy, *not* Hainan) and believed to breed in Japan, the Ryu Kyu Islands, in Formosa, Hainan, and on the Chinese coasts from Fukien to Chihli, and to winter in the Indo-Chinese countries and Malaysia; (2) *alexandrinus* of Linnaeus, a short-billed bird, described from Egypt and believed to breed from England across northern Asia to Korea, and to winter in Africa and all tropical Asia.

A good series of birds from Amoy (June, July) are decidedly paler than birds from Europe, have a longer and more massive bill, and in every case have the upperparts suffused with rufous. Swinhoe's description of *dealbatus* as a "washed-out," rufescent-tinged *alexandrinus* fits these specimens perfectly. Another series of badly worn birds from Chihli (July) are probably *dealbatus*. In addition, I have seen examples of this race from Hongkong (October, November) and Hainan (March).

Two birds from Thailand (November, March) and two from Malaya (December), all in winter dress, are so remarkably pale above that they stand out from all other Old World specimens I have seen and can fairly be compared only with *nivosus* and *tenuirostris* of North America. However, the wing length and size of bill are like

[1] Published by permission of the Secretary of the Smithsonian Institution. Received October 29, 1940.

those of *dealbatus*, and for the present I take them to represent merely a plumage phase of that form. If this surmise be correct, they are the only specimens of *dealbatus* I have seen from any locality outside of China.

A series of birds from Japan (January, March, April, May), some of which are in full nuptial plumage, have the upperparts without the least rufescent wash and quite as dark as European specimens but differ from the latter in having the bill as long and as massive as *dealbatus*. For the resident bird of Japan, I propose the name **Charadrius alexandrinus nihonensis** subsp. nov., with the type specimen an adult male, U.S.N.M. no. 95938, taken at Aomori, Hondo, April 23, 1876, by Capt. T. W. Blakiston.

Birds of the Asiatic mainland north of the range of *dealbatus* are dark-backed and have the bill somewhat smaller than *nihonensis* but nevertheless larger than *alexandrinus*. There is no doubt an imperceptible change from *nihonensis* to *alexandrinus*, and without series of breeding birds from Siberia and Mongolia a convenient geographic line of demarcation between the two can not be decided upon.

There is a certain amount of normal variation in bill size in any given form of this species, and younger birds tend to have shorter bills than their parents. However, even the shortest-billed examples from the Pacific coasts of Asia have the bill rather more massive than European birds of corresponding age and sex—a difference that must be seen to be appreciated—and are thus better called *nihonensis*. Specimens either inseparable from Japanese birds or nearer them than *alexandrinus* have been examined from Korea (December), Kiangsu (January, March, April), Chekiang (February), Fukien (October, November, January), Hongkong (October), Hainan (October), Luzon (February, March), Cebu (November), Siquijor (February), Jolo (March), Thailand (November, May), and Malaya (December).

The easternmost birds seen that, in my opinion, may more or less safely be called *alexandrinus* are two specimens from Szechwan (December) and six from northwestern Thailand (October, November, January).

The recent discovery of a resident form of the Kentish plover on the Island of Java (*Charadrius alexandrinus javanicus* Chasen) confirms the correctness of the opinion expressed by Peters as to the specific distinctness of *Charadrius peronii*. As Chasen observes (1938) that he has seen no true *peronii* from Java, it may be well to note that the U. S. National Museum has an adult pair, taken in the Province of Bantam by O. Bryant in December, 1909.

Charadrius peronii is already known to occur on the eastern coast of the Malay Peninsula as far north as the Sam Roi Yot district of southwestern Thailand. What appears to be the first record for this species from the opposite side of the Gulf of Siam is an adult male (one of a pair seen) with enlarged gonads, collected by me near Chanthabun, southeastern Thailand, on May 7, 1937.

ENTOMOLOGY.—*Two new species of coccinellid beetles from Costa Rica and Colombia.*[1] EDWARD A. CHAPIN, U. S. National Museum.

The descriptions of two synonychine Coccinellidae are here offered in order that their names may be available for use in the literature of economic entomology. One of the species was submitted by Dr. Luis María Murillo, who reports that it was taken on apple at Bogotá, Colombia; the other has been collected repeatedly in Costa Rica, sometimes associated with avocado. Both species are somewhat aberrant, and the generic assignment of the *Cycloneda* may eventually have to be changed.

Cycloneda costaricae n. sp.

Similar in form but larger than *C. sallei* (Muls.) and with two subbasal spots on each elytron instead of a single humeral spot as in that species. The genital structures are also distinct from all species known to the writer.

Body pale except that the metasternum is more or less deep piceous. Head pale yellowish, without maculation in either sex. Pronotum pale yellowish, with the six spots of deep piceous, almost black. Two of the spots are basal and roughly triangular and divide the base into nearly equal thirds; two are discal, somewhat oval and separated by less than the transverse diameter of either; two are lateral, nearly round and each distant from the lateral margin by less than its own diameter. Scutellum black. Elytra with a narrow elongate spot at the scutellum and a second narrowly oval spot at apical third common to both. In addition to the spots common to both, each elytron bears eight blackish spots as follows: Two subbasal placed on either side of the humeral callus, separated one from the other by about one-third of the diameter of either and each separated from the adjacent margins of the elytron by nearly its diameter; three subquadrate spots in a transverse row just before the middle of the elytron, the sutural spot being slightly less advanced than the others; two at apical third, each subcircular and slightly smaller than any of the preceding row, forming with the common sutural spot a nearly straight transverse row and finally a single subapical spot, larger than any of the others and slightly closer to the margins of the elytron. Legs and other appendages pale. Aedeagus with slender median lobe which is bifurcate at apex and with slender, hooked parameres (Fig. 1). Receptaculum seminis slender, hooked, duct entering through a side chamber; duct sclerotized, simple, straight and slender (Fig. 2). Length: 4.5 to 6 mm.

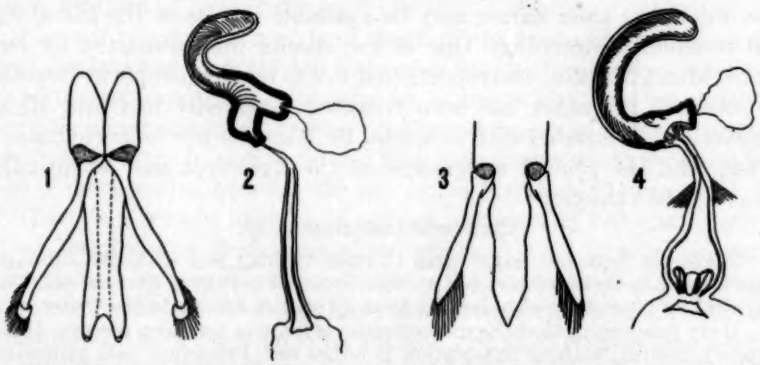
Type and five paratypes.—U. S. N. M. no. 54927.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received December 3, 1940.

Type locality.—Costa Rica, San José (San Pedro de Montes de Oca).

Material examined.—Type (male) and two paratypes taken at the type locality December 5, 1932, and January 20, 1933, by C. H. Ballou (Ballou no. CR 40); one paratype from San José, July 12, 1931, one from Coronado, May 24, 1925, and one from Curridabat, December 30, 1924, all taken by Ferd. Nevermann.

Remarks.—This species has been in the past confused with *C. sallei* (Muls.), and it is very probable that the Costa Rican record of *sallei* in the Junk-Schenkling (Korschefsky) Catalog should be crossed out. The record is apparently based on the San José (Nevermann) paratype, which carries Korschefsky's identification label. Through the kindness of Gaston Vivas-Berthier, the national collection now contains a specimen of the true *C. sallei*, taken by him at or very near the type locality, given by Mulsant as "environs de Caracas."



Figs. 1–2.—*Cycloneda costaricae* n. sp.: 1, Aedeagus; 2, receptaculum seminis and duct. Figs. 3–4.—*Neda murilloi* n. sp.: 3, Aedeagus; 4, receptaculum seminis and duct.

Neda murilloi n. sp.

Similar in form and size to *N. amandi* Muls. from which it differs in having a conspicuous apical elytral spot and in the genital structures of both sexes.

Body and appendages (except elytra) deep piceous black. Head rather coarsely and densely punctured, hairy, black. Pronotum transverse, very little more than half as wide as the combined elytra at widest point, black with a quadrate pale spot in each anterior angle, surface finely and densely punctured, glabrous. Scutellum black. Elytra pale yellowish white with sutural and lateral margins very finely margined with black. In addition, there is a transverse oval spot across suture at basal third and a nearly circular spot across suture at apical third. Further, there is a longitudinal row of four spots as follows: a nearly circular spot on humeral callus, a subtriangular spot just beyond basal third, a small spot at apical third which joins the second sutural spot and an apical spot joining the lateral margin. There are also two subquadrate spots joining the lateral margin, one at basal third, the second at apical third. Aedaegus with median lobe acuminate, para-

meres straight and slender (Fig. 3). Receptaculum seminis of female slender, C-shaped, duct sclerotized, flask-shaped (Fig. 4). Length: 9 mm.

Type and paratype.—U. S. N. M. no. 54928.

Type locality.—Colombia: Bogotá.

Material examined.—Two specimens, a male (type) and a female, taken on apple tree by Dr. Luis M. Murillo (Murillo no. 46).

Remarks.—This interesting species closely resembles at first glance *Neda amandi* Muls. but differs from any of the color forms of this species by the presence of the well-defined semicircular apical spot. But of much more importance is the fact that the genital structures of both sexes are very aberrant for the genus. *N. murilloi* is the only species of the genus known to the author having the median lobe of the aedaegus acuminate or having such a complicated sclerotization of the duct connecting the bursa and receptaculum in the female. Unfortunately the basal piece of the aedeagus was injured at the time of dissection and cannot be described or figured. The writer takes pleasure in naming this species in honor of Sr. Dr. Luis María Murillo, director of the Department of Entomology of the National University at Bogotá.

ICHTHYOLOGY.—*Pluralité spécifique du genre* Pegusa [*Pleuronectoidea Soleiformes*].[1] PAUL CHABANAUD, Muséum National d'Histoire Naturelle, Paris. (Communicated by AUSTIN H. CLARK and LEONARD P. SCHULTZ.)

En 1929,[2] examen fait de quelque 125 spécimens, j'ai cru bon de réunir sous un seul et même nom d'espèce, *Pegusa lascaris*, tous les Soleidae dont les caractères morphologiques répondent à la définition du genre *Pegusa* Günther 1862[3] à savoir: *Pleuronectes lascaris* Risso 1810,[4] *Pleuronectes nasutus* Pallas 1811, *Pleuronectes solea* var. *c* Nardo 1924, *Solea pegusa* Yarrell 1829, *Solea impar* Bennett 1831, *Solea scriba* Valenciennes 1835, *Pleuronectes nasutus* Rathke 1837, *Solea brasiliensis* Kaup 1858 (= *Solea kaupi* Berg 1895), *Solea aurantiaca* Günther 1862, *Solea margaritifera* Günther 1862, *Solea triophthalmus* Bleeker 1863, et *Solea vermeuleni* Metzelaar 1919. À l'exception de *Pleuronectes nasutus* Rathke (si ce n'est un paratype de *Solea nasuta* Nordmann 1840), à l'exception également de toutes celles dont la description a été publiée avant l'année 1831, j'ai eu sous les yeux le type même d'après lequel ont été rédigées ces diveres diagnoses.[5]

[1] Received December 14, 1940.

[2] Ann. Inst. Océan., 7: 231. 1929.

[3] Creé a titre de sous-genre (Cat. Fish. 4: 462. 1862).

[4] Espèce traditionnelle. Cfr. Chabanaud, *Les poissons pleuronectes de la Méditerranée* (Riviera Scientifique, mém. 2, p. 34. 1931).

[5] Ainsi que l'on peut s'en rendre compte par la consultation de la liste contenue dans mon travail de 1929, p. 240 et seq., travail cité plus haut, le matériel dont je disposais à cette epoque se trouve disséminé dans sept collections différentes, dont quatre appartiennent à des nations étrangères à la France. On comprenda que la douloureuse situa-

Nonobstant certaines différences dont il sera question plus loin, tous les individus examinés présentent un faciès qui, dans son ensemble, demeure identique: forte proéminence du museau; insertion du 1er rayon notoptérygien au niveau de l'oeil migrateur, lequel est situé tout entier au-dessous du niveau de la ligne latérale cœliocercique; yeux conservant un contour circulaire, même lorsqu'ils ne sont pas exsertés; fausse paupière énantique non squameuse, d'où la possibilité de la délimitation de l'aire squameuse interoculaire, ainsi que de la mesure pratiquement exacte de la largeur de cette aire squameuse, dite "espace interoculaire"[6]; constance de la position et de la structure des narines, tant nadirales que zénithales;[7] dissimulation complète de la commissure maxillo-mandibulaire zénithale par le revêtement cutané; grand développement des lèvres mandibulares, notamment de la zénithale, qui, nullement ciliée, se replie sur elle-même extérieurement; constance de la forme du clidoste.[8] Les cretules intercanaliculaires des écailles sont entières, pour la plupart, mais très irrégulières et fortement onduleuses, manifestant un début de fragmentation en éléments disto-convexes.

Ceux des caractères morphologiques qui sont couramment utilisés en ichthyologie se montrent toutefois susceptibles d'une variabilité particulièrement étendue: S 95 à 140. D 60 à 90. A 52 à 75. P z 7 à 10. P n 7 à 10. V z 5. V n 5.

Compté sur 20 individus,[9] le nombre total des vertèbres oscille entre 42 et 48, mais seul diffère le nombre des vertèbres caudales, car celui des vertèbres abdominales a été trouvé constamment réduit à 9, sauf chez un seul spécimen, originaire de Douarnenez, qui a, pour formule rhachiméristique, a 10 [5+5]+c 37 = t 47.

Envisagé de la sorte, *Pegusa lascaris* jouit d'une géonémie extrêmement vaste, puisqu'elle s'étend de la mer du Nord au cap de Bonne-

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tion politique qui pèse actuellement sur l'Europe me mette dans l'impossibilité de revoir les spécimens que ne possède pas le Muséum National d'Histoire Naturelle. Force m'est donc, en ce qui les concerne, de me contenter de mes notes manuscrites, sans autre examen direct que celui d'écailles montées entre lame et lamelle et que, par bonheur, j'ai conservées par devers moi.

[6] Mesure impracticable lorsque la fausse paupière énantique est squameuse et, par son développement, confère à l'oeil non exserté un contour longitudinalement elliptique. Genres *Monochirus* Rafinesque 1814, *Microchirus* [Bonaparte 1832] Chabanaud 1938, *Bathysolea* Roule 1916, *Dicologlossa* Chabanaud 1927, *Solea* Quensel 1806, et *Buglossidium* Chabanaud 1930.

[7] Structure maintes fois décrite et figurée. Cfr. Chabanaud, Bull. Inst. Océan. 488: 44, 48. 1927; Ann. Inst. Ocean. 7: 231 et seq., fig. 21. 1929; Bull. Inst. Ocean. 555: p. 6. 1930.

[8] Ann. Inst. Océan., t. cit., ic. scripti 30, 31, et 32; tab. 2, ic. 1 et 2.

[9] Ann. Inst. Océan., t. cit., p. 252. Aux 16 spécimens mentionnés à cette place s'ajoute celui dont la cathodographie fait l'objet de la fig. 2 de la planche 2 de ce même travail. Par la suite, les vertèbres de 3 autres spécimens ont été comptées.

Espérance et même à la côte du Natal,[10] comprenant, avec la Manche (et la mer d'Irlande?) et la totalité de l'Atlantique oriental, au sud des iles Britanniques, la Méditerranée tout entière, l'Adriatique, la mer de Marmara et la mer Noire.

Or il s'agit en réalité d'une espèce composite. *Pegusa triophthalmus* [Bleeker 1863] s'isole de l'ensemble par la dimension plus grande et corrélativement par le nombre plus réduit de ses écailles, par la forme de celles-ci, mais surtout par celle des nadirales, enfin par le développement réduit de la membrane postradiaire terminale des deux nageoires impaires précèdant l'uroptérygie. Ces différences n'ont pas été remarquées par Bleeker, qui, à propos de la pholidose, se contente de cette mention: "squamis utroque ctenoidis"; elles m'avaient échappé jusqu'ici. Pour autant que je puisse l'affirmer, d'aprés l'examen de 3 spécimens, y compris l'holotype, ce qui, de ce chef, caractérise *Pegusa triophthalmus* s'allie constamment à la présence de 3 taches noires zénithales, qui sont à l'origine du nom que porte l'espèce.

Les descriptions suivantes permettront de distinguer l'un de l'autre, malgré leur étroite ressemblance, *Pegusa triophthalmus* et *Pegusa lascaris*.

Pegusa triophthalmus (Bleeker 1863) Figs. 1, 3–5

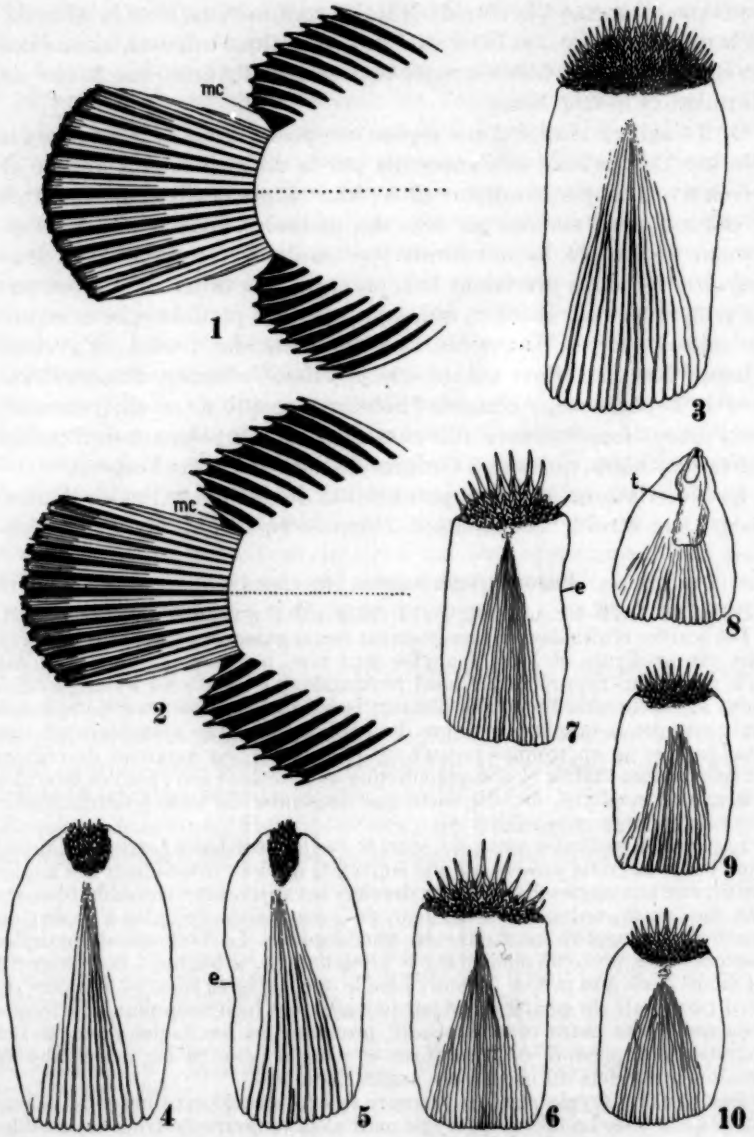
S 95–105. D 76–80. A 52–64. C (19) 20. P z 9. P n (7) 9. V z 5. V n 5.

Les écailles zénithales sont longuement rectangulaires; leurs bords latéraux sont subrectilignes et leurs 4 angles sont bien marqués. Le nucleus n'est qu'à peine plus rapproché du bord proximale que ne le sont les angles distaux. Mesurée entre les angles distaux, la longueur du bouquet de spinules égale presque la largeur moyenne du pholidoplaxe. Les spinules sont très nombreuses; on en compte jusqu'à 30 marginales. La longueur de celle-ci est relativement faible et n'augmente que modérément des spinules latérales à la spinule médiane, de telle sorte que l'ensemble de leurs pointes dessine une courbe large et régulière.

Les écailles nadirales sont plus courtes que les zénithales correspondantes; leurs bords latéraux présentent une convexité qui va s'intensifiant des angles proximaux aux angles distaux. Ces derniers se rapprochent considérablement l'un de l'autre, réduisant la largeur du bouquet de spinules à moins du quart de la largeur maximale du pholidoplaxe. Le bouquet de spinules s'enfonce très profondément dans le pholidoplaxe, atteignant une longueur au moins égale à sa propre largeur; ainsi le nucleus ne se trouve-t-il séparé du bord proximale du phanère que par une distance beaucoup plus courte que celle qui existe entre ce même bord proximale et les angles distaux. Les spinules sont presque rudimentaires et c'est à peine si les marginales se prolongent au'delà du niveau des angles distaux.

La thoracoptérygie zénithale mesure des 55 aux 60 centièmes de la longueur de la tête. La thoracoptérygie nadirale a toujours été trouvée sensiblement plus courte que la zénithale et ne mesurant que des 47 aux 51 centièmes de la même longueur prise comme étalon.

[10] C. VON BONDE, *Rep. Fish. Mar. Biol. Survey South Africa* 2: 17 (*Solea impar*). 1923.



Figs. 1–10.—(See opposite page for explanation.)

L'uroptérygie est libre; la membrane postradiaire terminale des deux autres périssoptérygies s'attache à l'extrême base de ses deux rayons marginaux, l'épaxonal et l'hypaxonal.

Le rayon terminal de la notoptérygie et celui de la proctoptérygie s'insèrent respectivement à quelque distance de l'uroptérygie. Les deux rayons marginaux de cette dernière nageoire sont beaucoup plus longs que le rayon terminal de chacune des deux autres perissoptérygies.

Deux spécimens, autres que l'holotype, ont respectivement pour formule rhachiméristique: *a* 9[4+5]+*c* 34 =*t* 43 et *a* 9[4+5]+*c* 39=*t* 48.

L'espèce n'est connue que de la côte occidentale de l'Afrique, entre la Mauritanie et le golfe de Guinée.

Pegusa lascaris (Risso 1810) Figs. 2, 6–10

S 108–140. D 65–90. A 53–75.[11] C (19) 20. P z 8–9. P n 8–9. V z (4) 5. V n (4) 5.

La forme générale des écailles est assez variable. Ces écailles sont rectangulaires, tantôt courtes, larges et à bords latéraux convexes (type de *Solea vermeuleni* Metzelaar), tantôt fortement allongées et à bords latéraux subrectilignes. La distance comprise entre le bord proximal et le nucleus n'est jamais qu'un peu plus courte que la distance qui sépare ce même bord proximal des angles distaux. Mesurée entre les deux angles distaux, la largeur du bouquet de spinules égale presque la largeur moyenne du pholidoplaxe ou, tout au moins, la largeur de celui-ci à ses angles proximaux. Les spinules sont plus robustes et moins nombreuses que chez *Pegusa triophthalmus*: on ne compte guère plus de 15 à 18 marginales. La longueur de celles-ci augmente rapidement des deux spinules latérales à la médiane, de telle sorte que la courbe dessinée par l'ensemble de leurs pointes se rapproche davantage de l'ogive que de l'arc de cercle.

Les écailles nadirales sont plus courtes que leurs homologues zénithales, généralement rectangulaires, parfois légèrement trapézoïdales; leurs bords latéraux présentent une convexité plus ou moins prononcée, d'où résulte un certain effacement des angles proximaux, comme des angles distaux. Ces derniers ne sont cependant guère plus rapprochés l'un de l'autre que les angles distaux; assui, mesurée entre ceux-ci, la largeur du bouquet de spinules demeure-t-elle constamment supérieure à la moitié de la largeur maximale du pholidoplaxe, pouvant même devenir—comme sur la face zénithale—subégale à la largeur moyenne de celui-ci. La distance comprise entre le bord proximal et le nucleus n'est guère plus courte, par rapport à la longueur du pholidoplaxe, mesurée du bord proximal aux angles distaux, que celle qui existe sur les écailles zénithales correspondantes. Les spinules sont en nombre similaire à celui des spinules zénithales; les marginales ne sont qu'à peine moins développées que ces dernières.

[11] Les nombres indiqués ici sont ceux que j'ai comptés moi-même. Sur des exemplaires de la mer Noire, Nordmann a trauvé: D. 60 et A 52.

Fig. 1.—*Pegusa triophthalmus:* Schema des nageoires impaires, à l'extrémité postérieure du corps. Fig. 2.—*Pegusa lascaris:* Schema des nageoires impaires, à l'extrémité postérieure du corps. Fig. 3.—*Pegusa triophthalmus:* Diagramme d'une écaille zénithale libre. Fig. 4.—*Pegusa triophthalmus:* Diagramme d'une écaille nadirale libre. Fig. 5.—*Pegusa triophthalmus:* Diagramme d'une écaille nadirale paragrammique (*e*, emargination du côte énantique). Fig. 6.—*Pegusa lascaris:* Diagramme d'une écaille zénithale libre. Fig. 7.—*Pegusa lascaris:* Diagramme d'une écaille zénithale paragrammique (*e*, émargination du côte énantique). Fig. 8.—*Pegusa lascaris:* Diagramme d'un écaille zénithale pleurogrammique (*t*, tube organique). Fig. 9.—*Pegusa lascaris:* Diagramme d'une écaille nadirale libre. Fig. 10.—*Pegusa lascaris:* Diagramme d'une écaille nadirale libre.

La thoracoptérygie zénithale est proportionnellement un peu plus courte que chez *Pegusa triophthalmus*, ne mesurant que des 38 aux 51 centièmes de la longueur de la tête. La thoracoptérygie nadirale atteint fréquemment une longueur égale à celle ce la zénithale; lorsque cette nageoire nadirale est plus courte que son homologue zénithale, la différence reste légère.

La membrane postradiaire terminale de la notoptérygie s'attache plus ou moins largement au rayon marginal concomitant de l'uroptérygie et il en est de même pour la membrane postradiaire de la proctoptérygie.

Le rayon terminale de la notoptérygie et celui de la protoptérygie s'insèrent respectivement contre le rayon marginal concomitant de l'uroptérygie. La longueur des deux rayons marginaux de l'uroptérygie n'excède pas, ou seulement fort peu, celle de rayon des deux autres perissoptérygies.

La formule rhachiméristique la plus basse qui ait été enregistrée se chiffre par *a* 9[4+5]+*c* 33=*t* 42. Les formules les plus hautes se chiffrent par *a* 9[4+5]+*c* 38=*t* 47 et par *a* 10[5+5]+*c* 37=*t* 47. Compté sur 4 spécimens, le nombre total des vertèbres est de 42 et 43, dans la Mer Noire. D'après 4 observations, ce nombre oscille entre 42 et 45 dans la Méditerranée occidentale. Dans l'Atlantique, entre la Manche et l'Angola, ce même nombre oscille entre 45 et 47 (7 observations). Enfin, 2 spécimens d'origine indéterminée, mais qui proviennent vraisemblablement de la Manche (marché de Paris), possèdent 47 vertèbres.

A cause de sa grande variabilité morphologique, *Pegusa lascaris*, dans l'immense étendue de son habitat, semble justiciable d'un démembrement en nations ou en sous-espèces locales, dont seule l'étude approfondie d'une quantité considérable d'individus permettrait de préciser les caractères.

Explication des figures.—Toute les écailles qui font l'objet des figures 3 à 10 ont été prélevées sur la partie moyenne du coeliocerque (région abdomino-caudale); les écailles dites "libres," à 2 ou 3 rangées au-dessus ou au-dessous de la ligne latérale. Celles de ces écaille qui sont prises comme témoins de la pholidose de *Pegusa triophthalmus* (figs. 3, 4, et 5), proviennent d'un spècimen male, de 206 millimètres de longueur totale et de 177 millimètres de longueur étalon, capturé en 1935, devant Bathurst, par le navire belge *Mercator*. Celles qui sont données comme examples de la pholidose de *Pegusa lascaris* (figs. 6 à 10) proviennent d'un spécimen male, de 248 millimètres de longueur totale et de 216 millimètres de longueur étalon, capture par le même navire et dans la même localité. Ces deux spécimens appartiennent au Musée Royal d'Histoire Naturelle de Belgique (Bruxelles).

HERPETOLOGY.—*A new genus of Central American snakes related to* TANTILLA.[1] HOBART M. SMITH.[2] (Communicated by HERBERT FRIEDMANN.)

The peculiar character of the teeth of certain members of the genus *Tantilla* (*brevissima, lintoni*) has been observed previously.[3] At the time the observations were made, it was not possible to determine whether the more generalized condition obtaining in these two species was the rule for Central and South American species of the genus, or whether other species might not show as less significant the apparently great difference between the two types of dentition. Representatives of most of the important species groups of the United States and Mexico were then examined, but no members of the several distinctly different groups of Central and South American species.

Since then I have been able to examine maxillae of most other species groups of the genus, including *canula, melanocephala, moesta, vermiformis,* and a species related to *taeniata,* all from Central and South America. A few more Mexican and United States species and subspecies that were not previously examined were also checked.

With the exception of *brevissima* and *lintoni,* the dentition of the maxilla holds to a rather well defined pattern, with relatively little variation. Invariably the teeth are flattened at the tips, and those anterior to the fangs are of subequal length. Two grooved fangs terminate the tooth series. The grooves are very well defined and the fangs sharply differentiated from the other teeth by their much larger size. Usually a small diastema precedes the fangs, but in some species there definitely is no diastema. Also the fangs are usually slightly or distinctly offset from the line of the other teeth, but this is definitely not the case in *canula* and *calamarina,* and in some others the extent of offsetting is negligible. There is no correlation between size of diastema and extent of offsetting of the fangs. The number of teeth, including fangs, varies between 12 and 19. *T. calamarina* has 12 (checked in two specimens); *atriceps, bocourti, nigriceps,* and a species related to *eiseni* have 13; *wilcoxi, fumiceps,* and *vermiformis,* 14; *eiseni, gracilis, canula,* and *miniata,* 15; *coronata, wagneri,* and *moesta,* 16; species related to *taeniata,* 17; and *melanocephala,* 17. Obviously there is no possibility of tracing relationships by number of teeth, for close relatives may differ considerably, and likewise species distantly related may have the same number of teeth. It is easily possible, how-

[1] Received October 31, 1940.
[2] Walter Rathbone Bacon Traveling Scholar, Smithsonian Institution.
[3] Proc. Biol. Soc. Washington 53: 60–61. 1940.

ever, that in case an intensive study were undertaken, the average number of teeth in a series of specimens of a species would show some significance in comparison with the average numbers of other species. Intraspecific variation was noted in *bocourti* (some have 10+2, others 11+2, others 12+2 teeth) and certain other species, and very likely occurs to a comparable extent in all species of the genus.

The two species most closely approaching the condition occurring in *lintoni* and *brevissima* are *calamarina* and *canula*. In these the difference in size between fangs and the other teeth is less than in other species. In *calamarina* the fangs are one and one-half times as long as the other teeth but are larger at the base, broader throughout their length, and appear at least twice the size of the preceding teeth. The grooves are very plain and deep. In *canula* the fangs are twice as long as the other teeth, deeply grooved, but their bases are not greatly larger, and accordingly their size is little more than twice that of the others.

In total number of maxillary teeth, *melanocephala*, the southernmost species of the genus, is the closest to *brevissima* and *lintoni*, but there is no close relationship to them, for the fangs are very large, offset, deeply grooved, and preceded by a diastema.

In *brevissima* and *lintoni* the rear teeth are not offset from the others, and there is no diastema whatever. In *lintoni*, there is absolutely no difference between the rear teeth and the others, either in size or grooving. Furthermore, the teeth do not exhibit the flattened condition (at the tip) obtaining in other species, but are thick throughout their length, with dull points. Finally, the teeth number 23 on one side, 25 on the other—considerably more than in other members of the genus.

T. brevissima is essentially similar to *lintoni*, but exhibits certain differences which show close relationship to other species of *Tantilla*. The rear teeth (presumably two, the extreme posterior tooth missing from its socket, but assumed to be similar to the tooth preceding) are visibly enlarged, perhaps one and one-third times as long as the others, their bases slightly larger, but their size apparently less than twice that of the other teeth. Otherwise, the rear teeth are exactly like the remainder, so far as I can see. They are somewhat rounded, with no evidence of grooves. The teeth preceding these are somewhat flattened at the tips, essentially similar to the teeth of other *Tantilla*. Finally, the total maxillary tooth count is 22.

Despite certain differences between the dentition of *brevissima* and *lintoni*, the two species are best associated together, since both have

ungrooved posterior teeth, and a considerably greater number of teeth than any other of the genus. It is possible that *Tantilla brevis* (which I have not seen) has similar dentition, but I think no other can be linked with these.

Because of the differences exhibited by these two species, it appears that they are best segregated from *Tantilla*. They are placed in

Tantillita gen. nov.

Diagnosis.—Hypapophyses absent in posterior part of vertebral column; scales in 15 rows, smooth, without apical pits; scales of head normal, except temporals 1+1, and no loreal; teeth on maxilla number 22 to 25, about equal in size, posterior teeth not at all or but slightly enlarged, not grooved; head somewhat flattened; size small; tail relatively short.

Genotype.—*Tantilla lintoni* Smith, Proc. Biol. Soc. Washington **53**: 61–62, fig. 1. 1940. (Piedras Negras, Guatemala).

Referred species.—*Tantilla brevissima* Taylor, Trans. Kansas Acad. Sci. **39**: 344–345, fig. 4. 1936 (1937) (Tonalá, Chiapas).

HERPETOLOGY.—*Notes on snakes of the genus* Conophis.[1] HOBART M. SMITH. (Communicated by HERBERT FRIEDMANN.)

The identification of a specimen related to *Conophis lineatus* from Chiapas, Mexico, has led to a review of available material of that genus from Central America and Mexico.

While all the members of the genus are pretty closely related, two major divisons are discernible. One contains *vittatus* (with its subspecies *viduus*) and is characterized by (1) the presence normally of seven supralabials and (2) the absence of pigment on the supralabial border, chin, ventrals, and first scale row. The second major division contains *lineatus* and *pulcher* and is characterized by (1) the presence normally of eight supralabials and (2) pigmentation on the supralabial border, chin, ends of ventrals (usually), and on the first scale row.

The subdivisions within the second division are, of course, specific, as there are only two species. One species (*pulcher*, with its subspecies *plagosus*) is characterized by (1) a well-defined color pattern, with 10 stripes at least posteriorly, the median pair on the paravertebral rows; and (2) presence of a dark stripe (actually the edge of the dorsolateral stripe) on (including) the second scale row on all the body (except neck). The second species (*lineatus*) is characterized by (1) less well defined stripes, some or all tending to become obsolete; no stripes or indication of stripes on the paravertebral rows on any part of the body; pattern essentially of six stripes; and (2) the second scale

[1] This study was completed and part of the material utilized was collected during tenure of a Walter Rathbone Bacon Traveling Scholarship of the Smithsonian Institution. Received November 13, 1940.

row free of stripes at least anteriorly, at no place involved by dorsolateral stripes. The following key contrasts certain differences between the various forms of the genus:

KEY TO RACES OF CONOPHIS

1. First scale row not pigmented on any part of body; chin and labial border white; usually seven supralabials.....2
   First scale row pigmented on part or all of body; chin and labial border pigmented; usually eight supralabials.....3
2. Four dark stripes posteriorly, the median pair separated by one and two half scale rows.....*vittatus vittatus*
   Three dark stripes posteriorly; if a light median area is present in median dark stripe, it is less than one scale row in width.....*vittatus viduus*
3. Dorsolateral dark stripe *which passes through eye* involving upper half of second scale row; a dark stripe on paravertebral scale rows, at least posteriorly.....4
   Dorsolateral dark stripe which passes through eye becoming indistinct on body, or restricted to fourth or third and fourth rows, not involving second row; no stripes on paravertebral rows on any part of body...5
4. Ends of ventrals with some indication of spots on some part of body; paravertebral stripes continuous posteriorly; other primary stripes not spotted in appearance; markings on chin and labial borders distinct.. .....*pulcher pulcher*
   Ventrals completely unpigmented; paravertebral stripes not continuous on any part of body; other primary stripes spotted in appearance; markings on chin and labial borders dim.....*pulcher plagosus*
5. Stripes disappearing on nape, not or but faintly visible posteriorly..... .....*lineatus concolor*
   Stripes visible throughout length of body.....6
6. Dorsolateral stripes becoming extremely narrow on nape, restricted to fourth scale row.....*lineatus lineatus*
   Dorsolateral stripes involving adjacent portions of the third and fourth scale rows.....*lineatus similis*

The various patterns of *pulcher* and *lineatus* are obviously derived from one similar to that of *viduus*, which I believe is nearest the ancestral type of the genus. It is rather difficult to discern whether *pulcher* or *lineatus* is the more primitive, but I have concluded that the former probably is, since the pattern of the latter seems to be reduction, not from the *viduus* type, but from the *pulcher* type. Reduction of the latter pattern type in *lineatus* took place in three directions, *concolor* becoming the most strongly modified, *l. lineatus* and *l. similis* changing the least. In fact, although the latter two are separated from each other by *l. concolor* and *p. pulcher*, they resemble each other closely. I believe these two might be given as examples of parallel evolution: both (likewise *concolor*) started on the same trend—toward loss of the stripes by both vertical and longitudinal breaking; and the two have now reached nearly the same stage in that process, although

widely separated geographically. Why *concolor* should have proceeded along the same trend so much more rapidly than either *l. lineatus* or *l. similis* is not readily obvious. The most apparent possibility is that it was isolated from the other stock during some geologic period, while the evolution of the other two was retarded through influence of the ancient *pulcher* stock, which apparently has no evolutionary trend toward loss of stripes.

Conophis vittatus vittatus Peters

Conophis vittatus Peters, Monatsb. Akad. Wiss. Berlin, 1860: 519–520, pl., fig. 3 (type locality not known).—Smith, Field Mus. Nat. Hist. Zool. Ser. **24**: 31. 1939 (type locality restricted to Acapulco, Guerrero).

Conophis sumichrasti sumichrasti Cope (part), Journ. Acad. Nat. Sci. Philadelphia, (2), **8**: 137. 1876 (type locality, Tehuantepec and Guadalajara).—Smith, Field Mus. Nat. Hist. Zool. Ser. **24**: 31. 1939 (type locality erroneously restricted to Tehuantepec).

Diagnosis.—Chin and labial borders white, not pigmented; usually seven supralabials; first scale row not pigmented; four dark stripes on posterior part of body, the lateral stripes covering less than two scale rows, the median pair separated by a light middorsal area one and two half scale rows wide.

Distribution.—Guerrero south into Oaxaca avoiding areas of considerable elevation.

Specimens examined.—Five, U. S. N. M. no. 29123, Guadalajara, Jalisco; U. S. N. M. nos. 31394–7, Colima.

Remarks.—*Conophis sumichrasti sumichrasti* was described on the basis of one specimen from "the western part of Tehuantepec" (U. S. N. M. no. 30258) and another from Guadalajara, Jalisco (U. S. N. M. no. 29123). The type locality was restricted to Tehuantepec by me (*loc. cit.*), but this can not stand, for Cope's very brief diagnosis does not apply to the Tehuantepec cotype, but rather to the Guadalajara cotype. Cope says "second row not covered by lateral band; dorsal bands distinct" for *sumichrasti*. In the Tehuantepec specimen the lateral band does involve the second scale row, and the dorsal bands are scarcely distinct (certainly not as much so as in the Guadalajara specimen, which is typical *vittatus*). Accordingly I designate the Guadalajara specimen, to which Cope's diagnosis of *sumichrasti* refers, as lectotype.

The Tehuantepec cotype of *sumichrasti* is not exactly typical of *viduus* but is much nearer it than to typical *vittatus*, if I correctly interpret the relative importance of difference between the two subspecies. The differences appear to be two, both in pattern: (1) *In viduus* the median dark stripe is single, covering about three and two half scale rows; if divided, the median light line is faint and narrow, of less than one scale width; in typical *vittatus* the median dark stripe is double, with the middorsal white area covering about one and two half scale rows; in this the whole median stripe (including the middorsal white stripe and the adjacent dark stripes on each side) covers

five and two half scale rows, while in *viduus* it covers a maximum of three and two half (or three-quarters) scale rows. (2) In *viduus* the lateral stripe is broader, anteriorly covering all of two, and parts of the adjacent, scale rows; in typical *vittatus* it covers less than two whole scale rows.

The cotype of *sumichrasti* agrees more nearly with typical *vittatus* in the character of the lateral stripe, which anteriorly covers a little less than two scale rows. However, the median stripe is not widely divided as in typical *vittatus* but agrees in condition with that shown by three other specimens from Tehuantepec, secured by me, in the National Museum. In these a narrow light stripe, beginning anteriorly shortly behind the neck, or first appearing nearly as far back as the middle of the body, is present on the middorsal scale row, and disappears at the base of the tail. The light stripe is less than a scale row wide. In all these the entire median stripe is three and two half scale rows wide, as in *viduus* with a uniform middorsal stripe.

I believe that the character of the middorsal stripe is of greater significance than that of the lateral and accordingly refer the cotype of *sumichrasti* to the synonymy of *viduus*. However, the intermediate condition shown by the cotype and the other specimens mentioned above rather strongly indicates that there may be intergradation between these two. The fact that the cotype of *sumichrasti*, which presumably comes from farther west (and nearer the known range of typical *vittatus*) than my specimens, approaches more closely to the characters of *vittatus* than specimens from near Tehuantepec, lends support to the belief that the two forms intergrade.

The identity of the type of *vittatus* is fortunately fixed by Bocourt, who published excellent illustrations of it (Mission Sci. Mex., Rept., pl. 38, fig. 7. 1886). The type is not from Tehuantepec, however, as inferred by Bocourt.

It is apparent that Cope considered the name of *vittatus* applicable to quite a different species than Peters described, as indicated in his check list (U. S. Nat. Mus. Bull. **32**: 76. 1887), in which he lists a specimen from Guatemala, collected by Dow. This is an intergrade between *concolor* and apparently *lineatus*. If this is what Cope interpreted as *vittatus*, it is apparent why he described *sumichrasti*.

Conophis vittatus viduus Cope

Conophis sumichrasti viduus Cope, Journ. Acad. Nat. Sci. Philadelphia (2) **8**: 137. 1876 (type, U. S. N. M. no. 30259); Tehuantepec.

Conophis sumichrasti sumichrasti Cope (part), *loc. cit.* (the Tehuantepec specimen).

Diagnosis.—Chin and labial borders white, not pigmented; usually seven supralabials; first scale row not pigmented; three dark stripes, the lateral more than the equivalent of two full scale rows in width, the median involving three and two half scale rows; sometimes a narrow light stripe, less than one scale row in width, extending down part of vertebral scale row, but in this case the entire median stripe is no wider than in other specimens.

Distribution.—Area about Tehuantepec, Oaxaca.

Specimens examined.—Nine, U. S. N. M. nos. 30258–9, 109709–14; one in the EHT-HMS collection.

Remarks.—See remarks under *vittatus vittatus*. The type of *viduus* (U. S. N. M. no. 30259) has been examined and is typical of the form here defined under that name. There is no evidence in it of a light streak along the vertebral scale row.

Conophis pulcher pulcher Cope

Conophis pulcher Cope, Proc. Acad. Nat. Sci. Philadelphia, 1868: 308 (Petén, Guatemala; three cotypes, U. S. N. M. nos. 6751, 6803).—Bocourt, Mission Sci. Mex., Rept., livr. 10: pp. 645–647, pl. 38, fig. 6 (a good illustration). 1886.

Diagnosis.—Chin and labial borders pigmented; usually eight supralabials; a dark stripe along first scale row, at least posteriorly; lateral dark stripe (i.e., the continuation of the ocular stripe) involving median half of second scale row, all of third and outer half of fourth, over all of body; a secondary dark stripe on paravertebral scale rows (except on extreme anterior part of body), broken anteriorly (spotted), continuous posteriorly and enclosing a light area one and two half scale rows wide; ends of ventrals spotted or slightly pigmented on some part of body.

Distribution.—Known only from "Petén."

Specimens examined.—Three, from Petén, Guatemala (U. S. N. M. nos. 6751, 6803).

Remarks.—I have seen no intergrades between this and *lineatus*. The rather sharp difference between these two in position of the lateral stripe and the presence in *pulcher* of secondary paravertebral stripes leads me to believe that intergrades do not occur.

In one specimen of *pulcher* the lateral stripes are solid throughout their length; in two others they are light medially, with regular black edges.

The subspecies *plagosus* is very similar, having the same differences from *lineatus* as *pulcher*.

Conophis pulcher plagosus subsp. nov.

Conophis pulcher Cope (part), U. S. Nat. Mus. Bull. **32**: 77. 1887 (a specimen mentioned from "Chiapas," collected by Montes de Oca).

Holotype.—U. S. N. M. no. 109707, female, from Tonolá, Chiapas, collected by Hobart M. Smith.

Diagnosis.—Chin and labial borders pigmented, but dimly; usually eight supralabials (?); a dark stripe along first scale row, at least posteriorly; lateral dark stripe (i.e., the continuation of the stripe through eye) involving median half of second scale row, all of third and outer half of fourth, over all of body; a series of spots on scales of paravertebral rows, beginning at middle of body, extending to base of tail; spots elongate toward posterior end of body, but not forming a continuous line; ventrals completely unspotted; all lines on body somewhat spotted in appearance.

Scutellation of type.—Ventrals 169; caudals 67; scale rows 19–19–17; supralabials 7–8; infralabials 9; one preocular; two postoculars, two temporals.

Remarks.—This form is differentiated from *pulcher pulcher* by having (1) the ventrals completely unspotted; (2) secondary lines on paravertebral rows not continuous posteriorly; (3) all other lines on body also somewhat

spotted in appearance; (4) dusky markings on chin and supralabial border very dim (less distinct than in *p. pulcher* or any member of the *lineatus* series). Very probably this does not now intergrade with *p. pulcher*, from which it is pretty well isolated. However, its essential characters definitely link it with *p. pulcher*, and the differences between it and the latter are no greater than those between *vittatus* and *viduus*, or between *concolor* and *similis* or *lineatus*.

Conophis lineatus lineatus (Duméril and Bibron)

Tomodon lineatus Duméril and Bibron, Erp. Gen. 7: 936–938, pl. 73. 1854 (Mexico).—Bocourt, Mission Sci. Mex., Rept., livr. 10: 643, pl. 38, fig. 5 (an excellent illustration of one of the types). 1886.

Diagnosis.—Chin and labial borders pigmented; usually eight supralabials; a dark stripe along first scale row, at least posteriorly; lateral dark stripe (i.e., the continuations of the stripe through eye) very narrow posterior to nape, extending along fourth scale row; posteriorly a stripe along third and eighth (farther posteriorly the seventh) scale rows; a narrow dark stripe along sixth scale row, continuous throughout length of body; another narrow dark stripe, more spotted anteriorly, on first scale row; all stripes at least slightly spotted in appearance; ends of ventrals spotted in at least some part of body.

Distribution.—The only specimen known with definite locality is from Paso del Macho, Veracruz.

Specimen examined.—One, from Paso del Macho, Veracruz (U. S. N. M. no. 109708).

Remarks.—The character of the lateral stripes easily distinguishes this from *l. similis;* a second prominent difference is the presence of a secondary line posteriorly along the seventh scale row.

The identity of the types of *lineatus* is none too well fixed, in spite of Bocourt's excellent illustration of one of them. I have concluded that the name is based upon the Mexican form rather than the Costa Rican, for the following reasons: (1) Types said to be from Mexico; (2) no markings on third scale row shown on types (dorsolateral stripes involve most of third scale row in *similis;* the condition in the types, even to the small spots on the scales of the second row, is matched by the Mexican specimen available at least on one part of body); (3) markings on eighth scale row (beginning of secondary stripe) shown for types, as in the Mexican specimen (*similis* shows no such markings).

Conophis lineatus concolor Cope

Conophis concolor Cope, Proc. Acad. Nat. Sci. Philadelphia, 1866: 318 (Yucatán; two cotypes, U. S. N. M. no. 12368).

Diagnosis.—Chin and labial border pigmented; usually eight supralabials; no stripes evident on body, dorsal surface gray, ventral surface white, the dorsal color extending onto first scale row; three stripes on head, the median poorly defined, all disappearing on neck.

Distribution.—Peninsula of Yucatán and area at its base, east through northern Honduras.

Specimens examined.—Five, including the cotypes and U. S. N. M. no. 4941, Petén (?), Guatemala; U. S. N. M. no. 20271, Patuca, Honduras; and U. S. N. M. no. 46395, Chichen Itza, Yucatán.

Remarks.—Several specimens, all typical, are known from the Peninsula of Yucatán. In addition, a perfectly typical example from Patuca, Honduras, is present in the National Museum (no. 20271).

An intergrade between *concolor* and probably *lineatus* is in the National Museum (no. 4941). The catalog states that this is from El Salvador, collected by J. M. Dow. However, an old paper label, on which is written "*Conophis vittatus*, Petén, J. M. Dow," is in the bottle, and accordingly I think this is the specimen, from that locality, mentioned by Cope in 1887 (U. S. Nat. Mus. Bull. **32: 76**) under the name *vittatus*. It is certain, moreover, that this specimen is an example of what Cope believed *vittatus* to be, for he states in 1876 (Journ. Acad. Nat. Sci. Philadelphia (2), **8: 137**) that this species has the "body without bands, but faint traces of them on first, third and seventh rows of scales." This certainly applies to the specimen in question.

In this intergrade the median dark stripe on the head is well defined, as are the lateral head stripes; these disappear on the nape. A dark stripe extends the full length of the body on the first scale row; anteriorly and in the middle of the body it is dim, poorly defined. A fine, dotted black line, beginning a little anterior to the middle of the body, extends along the fourth scale row to the position of scale row drop; from this point to the anus it is continued on the third scale row; in the extreme posterior part of body a similar line extends along the fourth scale row to anus. At about the middle of the body a fine, dotted dark line becomes evident on the seventh scale row; it becomes more distinct posteriorly, becoming almost continuous near base of tail; posterior to the position of scale row drop it follows the sixth scale row.

Conophis lineatus similis subsp. nov.

Conophis lineatus Cope (*nec* Duméril and Bibron), U. S. Nat. Mus. Bull. **32: 77.** 1887 (San José, Costa Rica; Nicaragua).

Holotype.—U. S. N. M. no. 79963, female, Managua, Nicaragua, collected by Lt. H. C. Kellers.

Paratypes.—Three, one a topotype (U. S. N. M. no. 79964); one, in very poor condition, from "Nicaragua" (U. S. N. M. no. 25237); and one from Esparta, Costa Rica (U. S. N. M. no. 37758).

Diagnosis.—Chin and labial borders heavily pigmented; usually eight supralabials; a dark stripe along first scale row; lateral dark stripe (i.e., that which passes through eye) restricted to the third and fourth scale rows throughout the length of the body, solid (without a broad light median area between two dark edges); a dark stripe on seventh (sixth posteriorly) scale row; no secondary dark stripes on either paravertebral rows or those adjacent to them laterally; second scale row white anteriorly, posteriorly with a dotted secondary line; ends of ventrals pigmented in some part of body.

Scutellation of holotype.—Ventrals 170; anal divided; caudals 69; scale

rows 19–19–17; supralabials 8–8; infralabials 10–11; one preocular; two postoculars; temporals 2+2. Total length 553 mm; tail 121 mm.

Variations.—The ventrals and caudals, respectively, of the paratypes, in the order listed above, are: 169, 67 (♀); 174, 69 (♀) 170, 64(♂). Scale rows 19–19–17 in all; supralabials 7–8 in one, 8–8 in others; infralabials 8–9 in one, 9–9 in one, 10–11 in one; oculars and temporals as in type.

The topotypic paratype has the same pattern as the type. The stripes on the seventh scale rows are composed of small spots; all the stripes on the body give a spotted effect, although all except those on the seventh scale rows are continuous at least posteriorly. The chin and labial markings are very prominent, as are the spots on the ends of the ventrals.

The paratype from "Nicaragua" is very similar in coloration, except that the stripes on the seventh scale rows are continuous.

The paratype from Esparta, Costa Rica, does not show such a strong spotted effect as the others; the stripes on the seventh scale rows are broader; and the area between these two stripes is generally suffused with darker.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ACADEMY

365TH MEETING OF THE BOARD OF MANAGERS

The 365th meeting of the Board of Managers was held in the Board Room of the Cosmos Club on Friday, January 10, 1941. President CRITTENDEN called the meeting to order at 8:02 P.M., with 16 persons present, as follows: E. C. CRITTENDEN, F. D. ROSSINI, H. S. RAPPLEYE, G. STEINER, A. T. MCPHERSON, A. H. CLARK, W. A. DAYTON, H. L. CURTIS, W. RAMBERG, E. W. PRICE, C. L. GAZIN, W. W. DIEHL, and by invitation J. H. KEMPTON, R. J. SEEGER, and O. H. GISH.

The minutes of the 364th meeting were read and approved.

President CRITTENDEN announced the appointment of the most recent past Corresponding Secretary, N. R. SMITH, to the position of Archivist of the Academy for a term of 3 years.

C. L. GARNER, chairman of the Committee on Meetings, reported that negotiations were under way to have WARREN KELCHNER, chief of the Division of International Conferences of the U. S. Department of State, address the Academy at its meeting in April, with the other meetings as previously reported. Chairman GARNER also reported that his Committee had an unexpended balance of $29.20 from its budget allotment for 1940.

G. STEINER, chairman of the Committee on Membership, presented nominations for membership for 8 persons (5 resident and 3 nonresident).

The Board considered individually and duly elected to membership the 11 persons (9 resident and 2 nonresident) whose nominations were presented to the Board on December 6, 1940.

The Committee to Consider the Printing Contract for the Journal, F. G. BRICKWEDDE, chairman, presented its final report, recommending that the present contract be continued. In an appendix to its report, the Chairman presented some information concerning the possibility of saving several hundred dollars a year in the cost of publishing the Journal through the adoption of a 2-column format and 2 point smaller type, at the same time maintaining the present standards of quality and workmanship and the same average number of words to the issue. It was moved and carried that the Committee's

report be accepted, and further that "the Board of Editors shall consider the desirability of changing the Journal to a 2-column format and report its recommendations within 3 months."

The Committees on Awards for Scientific Achievement for 1940 presented the following recommendations with regard to these awards, which are limited to persons 40 years of age or less: For the Biological Sciences, A. H. CLARK, chairman, reported that his Committee found no elegible candidate within the prescribed age limit who was considered worthy of the award, and therefore recommended that no award for 1940 be made for the biological sciences. For the Engineering Sciences, the Committee, F. M. DEFANDORF, chairman, recommended that the award for 1940 be made to HARRY DIAMOND, principal physicist in the Radio Section of the National Bureau of Standards, for his work in the development of methods and apparatus for the "blind-landing" of aircraft, in the development of methods and apparatus for obtaining meteorological data from appropriately equipped balloons sent into the atmosphere, and in the development of an automatic weather-reporting station. For the Physical Sciences, O. H. GISH, chairman, reported that his Committee recommended that the award for 1940 be made to FERDINAND G. BRICKWEDDE, chief of the Cryogenic Laboratory at the National Bureau of Standards, for his work in assisting in the discovery of deuterium, in determining the physical properties of the various isotopic forms of the hydrogen molecule, and in establishing a working temperature scale for the range 14° to 83° Kelvin. It was moved and carried that the Board make the awards as recommended by the Committees.

The Committee to Consider Several Problems Relating to the Journal, W. W. DIEHL, chairman, presented a report recommending that (1) the number of copies of the Journal to be printed currently each month shall always exceed the membership and subscription list by a margin of at least 75; (2) for the purpose of ensuring future sales, particularly as a service to new subscribers, there be authorized a reserve of 25 sets, from which no numbers or volumes may be sold except in complete sets, consisting of 8 sets of volumes 1 to 30, 6 sets of volumes 11 to 30, and 11 sets of volumes 16 to 30, and that a reserve of 25 complete volumes shall be provided each year thereafter; and (3) the first $300 realized from the sale of complete sets of the Journal shall be retained in the Treasury at the disposal of the Custodian and Subscription Manager of Publications, to be used at his discretion for the sole purpose of completing the contemplated 25 reserve sets now only partially complete. The Board accepted and approved these recommendations.

The Corresponding Secretary presented the following statistics regarding the membership: Deaths, 1; acceptance to membership, 1; members qualifying by payment of initial dues to the Treasurer, 5; retirements, 3; resignations, 4.

Adjournment was at 10:20 P.M., at which time the Board partook of refreshments provided by President CRITTENDEN, on the occasion of this last meeting of the Board during his term of office.

FREDERICK D. ROSSINI, *Corresponding Secretary*

CHEMICAL SOCIETY

524TH MEETING

The 524th meeting was held in the Hall of Government, George Washington University, on Thursday, October 10, 1940, President HANN presiding. Following the completion of routine business of the Society, the following communications were presented in three sections:

Organic and Biological Chemistry, S. N. WRENN presiding

A. KOSSIAKOFF and H. SPRINGALL, Catholic University of America: *A structural investigation of the Mills-Nixon effect.*

L. L. MADSEN and R. E. DAVIS, U. S. Bureau of Animal Industry: *Carotene and vitamin A in cattle blood plasma.*

H. S. ISBELL and H. L. FRUSH, National Bureau of Standards: *Reactions and properties of the carbohydrates in relation to the Walden inversion.*

Physical Chemistry, M. H. VAN HORN presiding

N. BEKKEDAHL and L. A. WOOD, National Bureau of Standards: *Stark rubber.*

G. R. GREENBANK, U. S. Bureau of Dairy Industry: *Photochemical oxidation of fats and oils.*

E. J. JONES (introduced by S. B. HENDRICKS), U. S. Bureau of Plant Industry: *The association of phenol in carbon tetrachloride from infrared data.*

Inorganic and Analytical Chemistry, D. C. KNOWLES presiding

R. T. O'CONNOR, U. S. Bureau of Plant Industry: *Spectrochemical methods for the quantitative analysis of trace elements in phosphate rock.*

R. R. WHETSTONE, W. O. ROBINSON, and H. G. BYERS, U. S. Bureau of Plant Industry: *The distribution of boron in soils.*

G. W. WARD, Portland Cement Association Fellowship at the National Bureau of Standards: *The polarizing microscope: A tool for the simplification of control and standardization of crystalline compounds.*

525TH MEETING

The 525th meeting was held in the Ladies' Parlor of the Cosmos Club on Thursday, October 24, 1940, President HANN presiding. Following the routine business, the Society was addressed by W. H. SEBRELL, M.D., of the National Institute of Health, on *Recent developments in vitamin research.*

526TH MEETING

The 526th meeting was held in the Auditorium of the Cosmos Club on Thursday, November 14, 1940, President HANN presiding. Election of officers for the Society for 1941 took place by means of preferential ballot. The following officers were elected:

President	H. L. J. HALLER	
Secretary	NORMAN BEKKEDAHL	
Treasurer	E. R. SMITH	
Councilors	W. D. COLLINS	J. H. HIBBEN
	R. E. GIBSON	G. E. F. LUNDELL
	R. M. HANN	B. H. NICOLET
	M. M. HARING	
Managers	J. J. FAHEY	A. T. MCPHERSON
	S. B. HENDRICKS	H. P. WARD
	H. S. ISBELL	C. E. WHITE

Following the completion of routine business, the Society was addressed by PER K. FROLICH, director of the Chemical Division of the Esso Laboratories, Standard Oil Development Co., Linden, N. J., who spoke on the subject *Frontiers in petroleum chemistry.*

527TH MEETING

The 527th meeting of the Society was held in the Auditorium of the Chemistry Building of the Catholic University of America, on Thursday, December 12, 1940, President HANN presiding. After the completion of routine business, the Society was addressed by DAVID HARKER, of the Johns Hopkins University, who spoke on the subject, *Water as a reagent in inorganic chemistry.*

NORMAN BEKKEDAHL, *Secretary*

Obituaries

RAYMOND PEARL, biologist, teacher, editor, and student of human populations and longevity, died suddenly on November 17, 1940, at Hershey, Pa. Born on June 3, 1879, at Farmington, N. H., the son of Frank and Ida May (McDuffie) Pearl, he received advanced education at Dartmouth (A.B., 1899), the University of Michigan (Ph.D., 1902), the University of Leipzig (1905), and the University College of London (1905–06).

After serving for brief periods as instructor in zoology at the University of Michigan (1902–06) and the University of Pennsylvania (1906–07), he was appointed in 1907 as head of the department of biology at the Maine Agricultural Experiment Station. From here he went to Baltimore in 1918 as professor of biometry and vital statistics—later (1930) professor of biology—at the School of Hygiene and Public Health, Johns Hopkins University.

The basic quality of Dr. Pearl's research has been recognized by the academic honors he received (Sc.D., Dartmouth, 1919; LL.D., University of Maine, 1919; Litt.D., St. John's College, 1935) and by the number of scientific societies to which he belonged, notably the National Academy of Sciences and the American Philosophical Society. Also, he was in frequent demand as a lecturer.

Dr. Pearl's publications include the following books: *Diseases of poultry*, 1915; *The biology of death*, 1922; *Introduction to medical biometry and statistics*, 1923; *Studies in human biology*, 1924; *Alcohol and longevity*, 1936; *Constitution and health*, 1933; *The natural history of popblation*, 1939. He was founder and editor of the journals Quarterly Review of Biology (1926) and Human Biology (1929).

"The world of science has lost a great leader, a fruitful scholar with wide experience and rare originality and a colleague always helpful and stimulating."

WALTER JORGENSEN YOUNG was born at Owensboro, Ky., on June 27, 1883, and died on November 23, 1940, at Fredericksburg, Va. Valedictorian of his class in Richmond College, he received his D.D. and Th.M. at Crozier Theological Seminary and his M.S. and Ph.D. at the University of Pennsylvania. He was, successively, professor of psychology and biology of Hampden-Sydney College (1911–1913), professor of philosophy and head of the department of philosophy at the University of Richmond (1913–1918), professor of social science at the State Teachers' College at Fredericksburg

(1919–1926) and at the same time minister at the Massaponax Baptist Church and Supervisor of Schools, professor of geography at the University of Tennessee (summer, 1925), professor of education at Winthrop College (1926–1929), and finally, until his death, head of the department of psychology and philosophy at Mary Washington College at Fredericksburg. He published a *Syllabus of comparative ethics* (1918), *Outline of general geography* (1925), and *Outline of early European history* (1925). His original genealogical research, *The Bristol Youngs in America* (1937), won him a Fellowship in the Royal Academy of Arts in London.

He obtained the Crozier Research Fellowship for his investigation of experimental psychology, *A study in practice and habit* (1912), introducing new unit methods of procedure in elementary school teaching. By his treatises *The correlation theory of psychology* (1929) and *Cause and effect* (1929), he tried to combine the new ideas introduced by Einstein and his successors with the Gestalt hypothesis of the German philosophers and to build a new foundation for the methods of psychology and a new psychological terminology. By these original and thoughtful publications he was brought into international notice.

Dr. Young was not a specialist, although his work, done in so various and distant fields of science, always had scientific value and was based on scientific methods. He loved God's colored world and was too much interested in understanding the whole to confine himself to some little corner. So he did not become a truly great specialist, but he was a truly great teacher, understanding the whole of life and interested in all spheres of science.

Dr. Young married Ethel Daniel and had two children: a daughter, Patricia Ann, the wife of Dr. James King in Fredericksburg; and a son, Walter J., Jr., chemist at the Sylvania Plant in the same city. Among his pupils and colleagues the memory of his splendid and lively personality will be fresh for a long time.